Australian Government

DEFENCE INDUSTRY & INNOVATION

2019–20 Defence Industry and Capability Innovation Programs **Annual Report**

NEXT GENERATION TECHNOLOGIES FUND

DEFENCE INNOVATION HUB

CENTRE FOR DEFENCE INDUSTRY CAPABILITY

Department of Defence
Russell Offices, ACT 2600
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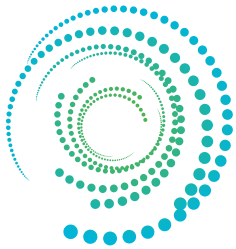
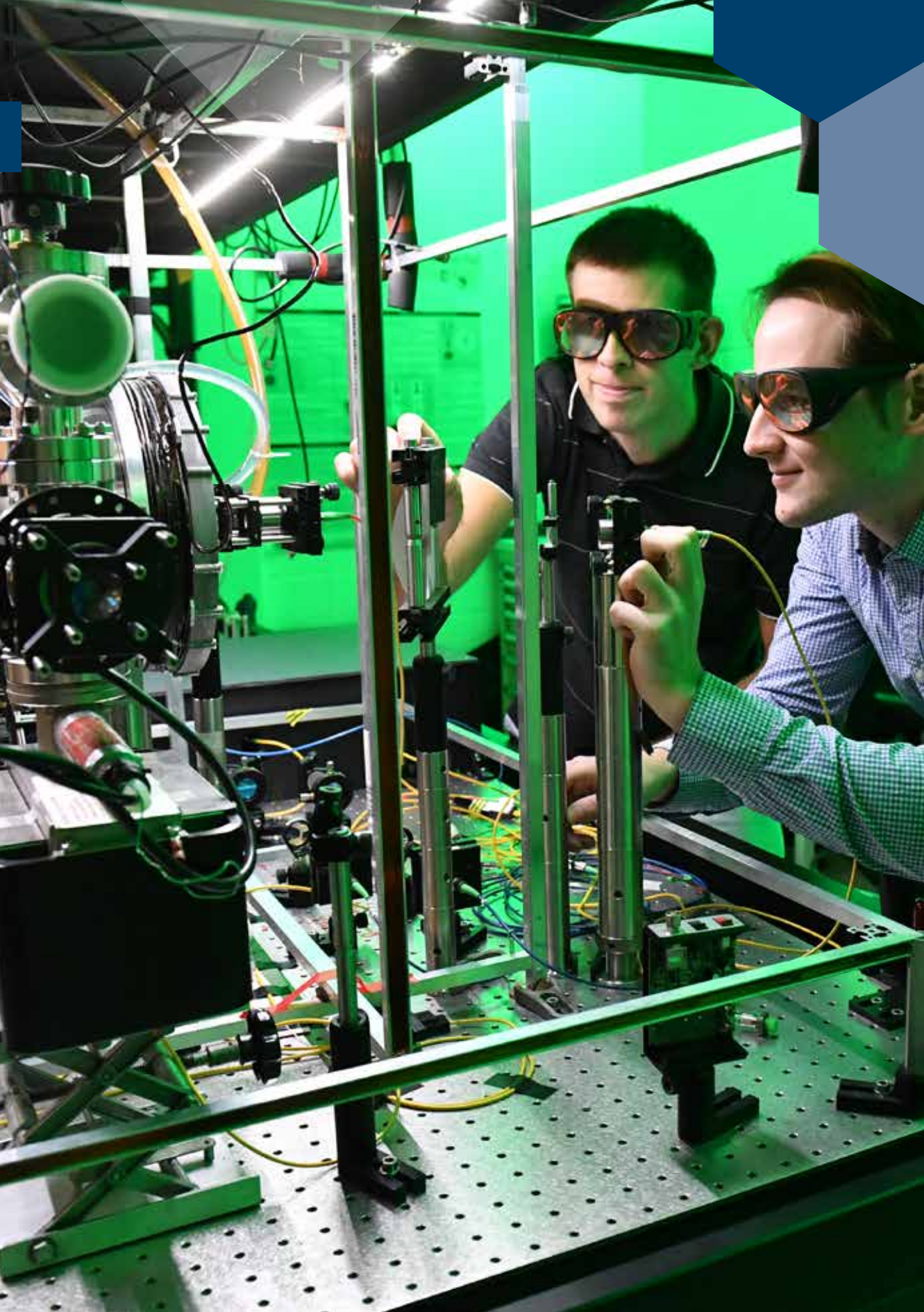
Australian Government

2019–20 Defence Industry and Capability Innovation Programs **Annual Report**





FOREWORD

I am pleased to present the fourth *Defence Industry and Capability Innovation Programs Annual Report*. The 2019–20 Report shows that the Next Generation Technologies Fund (NGTF) and the Defence Innovation Hub are continuing to deliver on the Government's commitment to growing Australia's defence industry and innovation sector, while turning the very best of Australian innovation into ground-breaking future capability. Sustained investment in research and innovation through these programs is critical to ensuring a strong, sustainable and secure Australian defence industry that can meet our future capability needs and the Government's strategic objectives, outlined in the *2020 Defence Strategic Update*. The Centre for Defence Industry Capability (CDIC) also continued to play an important role in building a world-class globally competitive Australian defence industry.

The NGTF continued to expand its collaborative activities with the Australian innovation sector during the year, including a new Grand Challenge, expanded research networks, and new research partnerships. Over the course of the year, the NGTF added 68 activities, worth more than $36 million, bringing the total number of collaborative agreements under the NGTF to more than 237. This investment provides a focus for fundamental research and the development of future game-changing concepts in critical technology areas. These activities are building Australia's defence research knowledge base to ensure that Defence will be ready to meet the challenges of a rapidly changing global environment.

In May 2020, Defence launched *More, together: Defence Science and Technology Strategy 2030*, which sets the direction for Defence science and technology out to 2030. Key to the Strategy is a set of eight aspirational S&T missions known as STaR (Science, Technology and Research) Shots. Designed to inspire and focus the national S&T enterprise on large-scale programs of work, the STaR Shots will support the outcomes of the NGTF, and ensure that there are identified pathways from research to utilisation in solving priority Defence capability gaps. The Strategy also signals the intent to shape a cohesive and coordinated innovation system across Defence.

The Defence Innovation Hub continued to grow its investment in new and innovative technologies in 2019–20, committing a record $105 million over 52 contracts to Australian businesses and research institutions. Hub contracts active in 2019–20 delivered economic benefits to every state and territory, employing more than 600 people across 150 businesses and 22 universities and research organisations. In just four years, the Defence Innovation Hub has invested almost a quarter of a billion dollars in the Australian industry and innovation sector, and of this, 84 per cent has gone to small and medium-sized businesses. It is pleasing to see that

technology developed through projects managed by the Defence Innovation Hub has begun transitioning to Defence acquisition programs, and I look forward to seeing more cutting-edge Australian technologies developed to a mature state through the Defence Innovation Hub.

In four years of operation CDIC services have helped Australian businesses compete for opportunities, deliver products and services on time, improve business productivity and sustainability, and have supported globally competitive innovation within the defence market. In April 2020, I announced a review into the CDIC to ensure it is optimised to get more Australian businesses engaged in the defence sector into the future. The recommendations of the review that were accepted by the Government will be implemented in 2021.

I have been proud to see our industry and innovation programs actively support Australia's defence industry and innovation sector during the COVID-19 pandemic. The programs provided tailored support to help Australian businesses adapt to COVID-19 challenges and supply chain vulnerabilities, including making progress payments, extending project timeframes, and adopting virtual platforms to allow program activities to continue. I expect these programs to continue to play a key role in supporting the industry and innovation sector during the pandemic, and to assist with economic recovery.

On 1 July 2020, the Government released the 2020 Defence Strategic Update and the 2020 Force Structure Plan, which outlined a new strategy for Defence and the capability investments to implement the new strategic objectives. The Force Structure Plan brought with it an unprecedented program of investment in Australia's defence industry, including around $3 billion across Defence innovation, science and technology over the next decade. This additional funding will generate continued growth in Australia's defence industry and innovation sector and deliver Australian innovative solutions for Defence capability.

I welcome this report on the progress of the Defence Industry and Capability Innovation Programs for the 2019-20 year and look forward to their continued success in improving the ability of the nation to innovate for Defence and turning innovative ideas into game-changing capability.

The Hon Melissa Price MP
Minister for Defence Industry

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OVERVIEW

In 2016, the Australian Government released the *2016 Defence Industry Policy Statement*, which called for a more focused, coordinated and transparent relationship between Defence and industry to maximise delivery of Defence capability.

The statement announced the establishment of three new initiatives to build the capability and capacity of Australian industry and the innovation sector to support Defence's capability requirements.

Next Generation Technologies Fund

The Next Generation Technologies Fund (NGTF) is a forward-looking program focused on research and development in emerging and future technologies. Launched in March 2017 and managed by Defence Science and Technology Group (DSTG), the NGTF engages the Australian innovation sector – universities, research agencies and industry – to shape research programs that will turn ideas into science and technology (S&T) with the potential to deliver capabilities for the 'future force after next'. The NGTF will invest over $1.2 billion in innovation over the next decade.

The Defence Science and Technology (S&T) strategy, More, together, launched on 4 May 2020, sets the direction for Defence S&T out to 2030. Key to the strategy is a set of eight aspirational S&T missions known as STaR (Science, Technology and Research) Shots. Designed to inspire and focus the national S&T enterprise on large-scale programs of work, the STaR Shots support the outcomes of the NGTF, ensuring that there are identified pathways from research to utilisation in solving priority Defence capability gaps.

Defence Innovation Hub

The Defence Innovation Hub, launched in December 2016, enables Defence, industry and research institutions to collaborate on innovative technologies that can be delivered as advanced capabilities for Defence. As at 30 June 2020, the Defence Innovation Hub had invested over $240 million in innovative technology, and it will fund over $800 million in further investment over the next decade. The Defence Innovation Hub accepts proposals that are ready to enter the engineering and development stages of the innovation process, from concept exploration and technology demonstration to prototyping and integrated capability demonstration and evaluation.

Centre for Defence Industry Capability

The Centre for Defence Industry Capability (CDIC) is a key Defence policy initiative aimed at strengthening the capability of Australian businesses to meet Defence's requirements by:

- building a strong, sustainable, secure and globally competitive Australian defence industry
- facilitating connections and engagements across Defence and Australian defence industry
- collecting, analysing and communicating industry intelligence

to inform policy development and evaluation.

The CDIC is a unique organisation that combines the program delivery and industry expertise of the Department of Industry, Science, Energy and Resources (DISER) with the strategic guidance of the Department of Defence. The CDIC is delivered by DISER to draw on the expertise and experience of the existing AusIndustry business service and program delivery infrastructure and to promote collaboration with other industry assistance programs, such as the Entrepreneurs' Programme.

A review of the CDIC was announced by the Minister for Defence Industry on 15 April 2020. Its findings will be published in the second half of 2020, with implementation to conclude in 2021.

The CDIC works with Australian businesses to strengthen their ability to meet current and future Defence requirements, providing a national network of Defence Industry Facilitators and Defence Business Advisers with regional and domain expertise to help businesses:

- navigate the defence market by providing tailored advice and support
- develop their industrial capabilities and ability to work with Defence
- improve competitiveness and access global markets
- connect with Defence and other businesses
- link with the Defence Innovation Hub and the NGTF.

The CDIC assists Australian businesses with accessing matched grants up to:

- $150,000 to help businesses access export opportunities
- $150,000 to help implement business improvements for defence industry
- $1 million to invest in business capabilities that are aligned with Defence's Sovereign Industrial Capability Priorities
- $1 million to help businesses or research organisations support development of new or improved capabilities that may help them win work in the Joint Strike Fighter Program supply chain
- $3 million to help Australian universities involved in successful submissions to the US Multidisciplinary University Research Initiative program.

FACTS AND FIGURES

2,300+ PROPOSALS RECEIVED FOR DEFENCE INNOVATION PROGRAMS

1,000+ ADVISORY AND FACILITATION SERVICES PROVIDED BY CDIC

380+ DEFENCE INNOVATION CONTRACTS SIGNED

$26.6M SOVEREIGN INDUSTRIAL CAPABILITY PRIORITY GRANTS AWARDED

3,200+ ATTENDEES AT NEXT GENERATION TECHNOLOGIES FUND AND DEFENCE INNOVATION HUB EVENTS

$3.5M DEFENCE GLOBAL COMPETITIVENESS GRANTS AWARDED

1,020+ JOBS SUPPORTED BY DEFENCE INNOVATION CONTRACTS

$7.6M CAPABILITY IMPROVEMENT GRANTS AWARDED

Progress in 2019–20 – achieving the Government's objectives

Now in their fourth year, Defence industry and capability innovation programs continue to achieve the policy objectives of the *2016 Defence Industry Policy Statement*:

- Enhance defence capability through innovation – by managing a portfolio of innovation investment that is coherent and aligned with strategic priorities
- Build capability and capacity of Australian defence industry – to support expansion and mobilisation of the ADF now and into the future.

ENHANCING DEFENCE CAPABILITY THROUGH INNOVATION

The NGTF, the Defence Innovation Hub and the CDIC have transformed the way Defence approaches innovation by supporting Australian businesses and academia in turning creative ideas into ground-breaking Defence capabilities. Together, they are helping Australia's industry and research sector turn innovative ideas into game-changing technologies that have the potential to enhance Australia's Defence capability.

Initiatives launched under the NGTF have continued to mature, supported by extensive engagement with Australia's innovation community. Since the program's inception, more than 1,400 proposals have been received from Australian universities, publicly funded research agencies and industrial entities, ranging from start-ups to long-established Defence primes. In 2019–20, new investments totalling $36 million brought the total commitment of the NGTF to more than $174 million.

NGTF partners include organisations from every state and the Australian Capital Territory (ACT). Research projects have been established across each of the technology priority areas identified in the *2016 Defence Industry Policy Statement*.

Building on the solid foundations established to date, the NGTF continued to expand in 2019–20, with more partnering opportunities and new research projects. Highlights included:

- exploratory research in human biotechnologies related to Enhanced Human Performance
- Phase 2 of the bilateral call between Australia and the United Kingdom (through the UK's Defence Science and Technology Laboratory and Defence and Security Accelerator)
- calls for participants in Phase 2 of the Counter Improvised Threat Grand Challenge
- expanding the research network in Integrated Intelligence, Surveillance and Reconnaissance.

Australian innovators working with Defence through the Defence Innovation Hub are developing cutting-edge and world-first technologies to equip our warfighters.

For example, in 2019–20 the Defence Innovation Hub invested over $46 million in uninhabited and autonomous vehicle technology, around $10 million in cyber technology innovations and around $9 million in radar technology innovations for land, maritime and space environments. To see how the Defence Innovation Hub's

portfolio of investment was directly linked to Defence's published capability priorities in 2019–20, see page 61.

As the Defence Innovation Hub's portfolio continues to mature, its investment in technologies that are closer to delivering Defence capability increases. In order to develop innovative technology towards enhanced Defence capability, the Defence Innovation Hub uses a phased approach that allows technology to be matured in collaboration with Defence's capability managers. Eight projects, valued at $30 million, transitioned to a follow-on phase of development in 2019–20. For more information on how the Defence Innovation Hub is progressing promising technologies towards higher stages of technical maturity and Defence capability outcomes, see page 62.

BUILDING THE CAPABILITY AND CAPACITY OF THE AUSTRALIAN DEFENCE INDUSTRY

In 2019–20, the CDIC continued to strengthen the capability of Australian businesses to meet Defence requirements and support the growth of Australia's defence industry. By combining the service delivery and industry expertise of DISER with the strategic outlook of Defence, the CDIC enabled many Australian business opportunities stemming from the Government's significant Defence capability investment. The CDIC is central to the Government's strategy for building a positive, intelligent and productive partnership between Defence and defence industry.

In the past year, the CDIC saw a continuing rise in demand for advisory and facilitation services from Australian small and medium businesses (under 200 employees) working or seeking work in defence industry. Additional Defence Business Advisers were engaged to meet this rise in demand, and the CDIC provided approximately twice the volume of advisory services compared to the previous year. These advisory and facilitation services assisted businesses to increase their ability to meet the demands and priorities of the defence market.

The CDIC experienced continued growth in grants in 2019–20, approving 119 Capability Improvement Grants to 59 Australian businesses to a total value of $3.78 million, a 60 per cent increase in value compared to 2018–19. The CDIC also approved 28 Sovereign Industrial Capability Priority Grants worth $11.56 million to 28 Australian businesses and 21 Defence Global Competitiveness Grants worth $2.27 million to 18 Australian businesses, double the number approved in 2018–19. These grant programs help Australian businesses build their capacity to deliver cutting-edge technologies, compete on the global stage and build Australia's sovereign industrial capability.

In 2019–20, the Defence Innovation Hub continued to build the capability and capacity of Australia's defence industry as well as to improve the ability of the nation to innovate for Defence. The Defence Innovation Hub is attracting businesses that are new to Defence, creating jobs, building skills and encouraging collaboration. Of the active projects in 2019–20, 93 per cent are expected to have a good, very good or exceptional impact on Australia's defence industry capability. The Defence Innovation Hub's investment

in Australian businesses and research organisations has supported more than 600 jobs across Australia, creating economic benefits in every Australian state and territory and in regional areas.

To date, over 100 individual small and medium businesses have benefited from Defence Innovation Hub funding. Twenty four per cent of the Hub's partners have been new to Defence, including eight new lead contractors in 2019–20. Many of these businesses have reported that, by diversifying into the defence sector through the Defence Innovation Hub, they have been able to attract investment, recruit specialist skills, and gain valuable experience in dealing with Defence and understanding Defence's capability requirements.

Throughout the latter half of the year, the Defence Innovation Hub also played a valuable role in assisting companies through the COVID-19 pandemic. Through close consultation with its partners, the Defence Innovation Hub supported businesses by providing vital support, including timeline extensions, progress payments and use of innovative solutions to overcome business challenges. In 2019–20, the Defence Innovation Hub signed 52 contracts with Australian businesses and research organisations valued at over $105 million, a 32 per cent increase from 2018–19. This significant increase in investment provided welcome support to innovative Australian businesses during the COVID-19 downturn.

DRIVING COMPETITIVENESS AND EXPORT POTENTIAL

The Defence Export Strategy (the Strategy), released in January 2018, outlines the goal of increasing exports to build a stronger, more sustainable and globally competitive Australian defence industry. The Australian Defence Export Office (ADEO) was established under the Strategy to provide a focal point for coordinating whole-of-government defence export support for the Australian defence industry. The ADEO collaborates with a range of Australian Government agencies including the Department of Foreign Affairs and Trade, Austrade, Export Finance Australia, the CDIC, and state and territory governments, to provide support to Australian defence industry exports.

Over the past year, the ADEO continued to implement a range of initiatives in the Defence Export Strategy, including:

The continued delivery of the Defence Global Competitiveness Grants, with 21 grants worth over $2.2 million awarded in 2019–20.

The Australian Defence Export Advocate, former Minister for Defence the Hon David Johnston, provided senior-level domestic and international advocacy on behalf of Australian defence industry. The Advocate has undertaken a range of domestic and internal engagements, including supporting a Team Defence Australia (TDA) delegation at the Defence and Security Equipment International in London in 2019, Pacific 2019 in Sydney, and the Singapore Airshow in early 2020. Due to the COVID-19 pandemic, the Advocate has increased focus on domestic opportunities, including

hosting Defence Industry Exports webinars in each state and territory.

The expansion of TDA's program of international trade shows continued to experience record attendance during the first part of the financial year. TDA has led delegations of Australian defence industry representatives to tradeshows in Poland, the United States, India and Singapore. The COVID-19 pandemic resulted in the cancellation or postponement of a number of international defence tradeshows. TDA supported industry participation in online events implemented by tradeshow organisers.

The release of the 2020 Australian Defence Sales Catalogue, previously known as the Australian Military Sales Catalogue. The 2020 Catalogue showcased defence industry products and services of 170 Australian companies – up 56 from the previous year – from all states and territories.

Defence's partnership with Austrade to support Australian companies in securing access to new markets. This includes the recruitment of local industry experts in additional key markets, including Singapore, bringing the total number of local industry experts to seven, further expanding Defence's international reach and engagement. An example of the additional support available was the delivery of a Landing Pad Program in San Francisco in 2019. Participation in the program has enabled several Australian companies to access opportunities in the United States.

The ADEO led a trade mission to Japan in November 2019 with 22 Australian defence industry companies and universities. The Minister for Defence, Senator the Hon Linda Reynold CSC, was in attendance to support the delegation showcasing Australian defence industry capabilities and services to Japanese partners.

MAJOR HIGHLIGHTS

15–16 July 2019: The NGTF launched QRNet as part of the quantum priority area. With a focus on quantum sensing and quantum communications technologies, the QRNet brings together researchers from the Australian National University (ANU), RMIT University, The University of Queensland, The University of Adelaide, the University of New South Wales (UNSW) and QuintessenceLabs.

13 August 2019: The Defence Innovation Hub signed its 100th contract. The $3.5 million contract was awarded to SYPAQ Systems Pty Ltd, a Victoria-based business, to prototype a small uninhabited aircraft system with a hybrid powertrain. This technology has the potential to operate effectively in harsh environmental conditions and optimise situational awareness for maritime operations.

28–29 August 2018: More than 800 visitors from industry, academia, government, the education sector and the scientific community attended SCINDICATE, DSTG's flagship partnering event.

25 September 2019: Army and the Defence Innovation Hub collaborated to deliver Army Innovation Day 2019, with industry presenting proposals on network assurance.

October 2019: Phase 2 of the joint Australia–UK Small Business Innovation Research for Defence (SBIRD) was launched, calling for proposals on innovative joining technologies to enable the integration of advanced materials on military platforms.

8–10 October 2019: The Defence industry and capability innovation programs exhibited at the 2019 Pacific International Maritime Conference.

4 November 2019: The Annual Defence Innovation Hub Industry Conference attracted around 400 people, taking the opportunity to learn more about the Defence Innovation Hub and hear updates from the Minister for Defence Industry and senior Defence leaders.

6 November 2019: The Defence Industry Internship Program was increased to 70 internships for engineering students.

6–7 November 2019: The inaugural National Defence Industry Skilling and Workforce Summit was held in Perth. The summit brought together stakeholders from across industry, government and education providers to support the effort to build a skilled defence industry workforce.

25–26 November 2019: Defence partnered with Noetic Solutions to hold the Emerging and Disruptive Technologies Assessment Symposium in Directed Energies in Sydney. The symposium attracted almost 100 attendees with keynote speakers from both the United Kingdom and the United States.

December 2019: The CDIC reached $50 million in total grants awarded to defence industry.

17 December 2019: Two Sovereign Industrial Capability Priority Implementation and Industry Plans were released to help industry understand Defence's key priorities for the future. These plans were for: Combat clothing survivability and signature reduction technologies; and Munitions and small arms research, design, development and manufacture.

30 January 2020: Army and the Defence Innovation Hub released the 2020 Army Innovation Day Challenge Statement seeking innovation proposals to assist Defence in enhancing Land Force Support System 'sense and respond' capabilities.

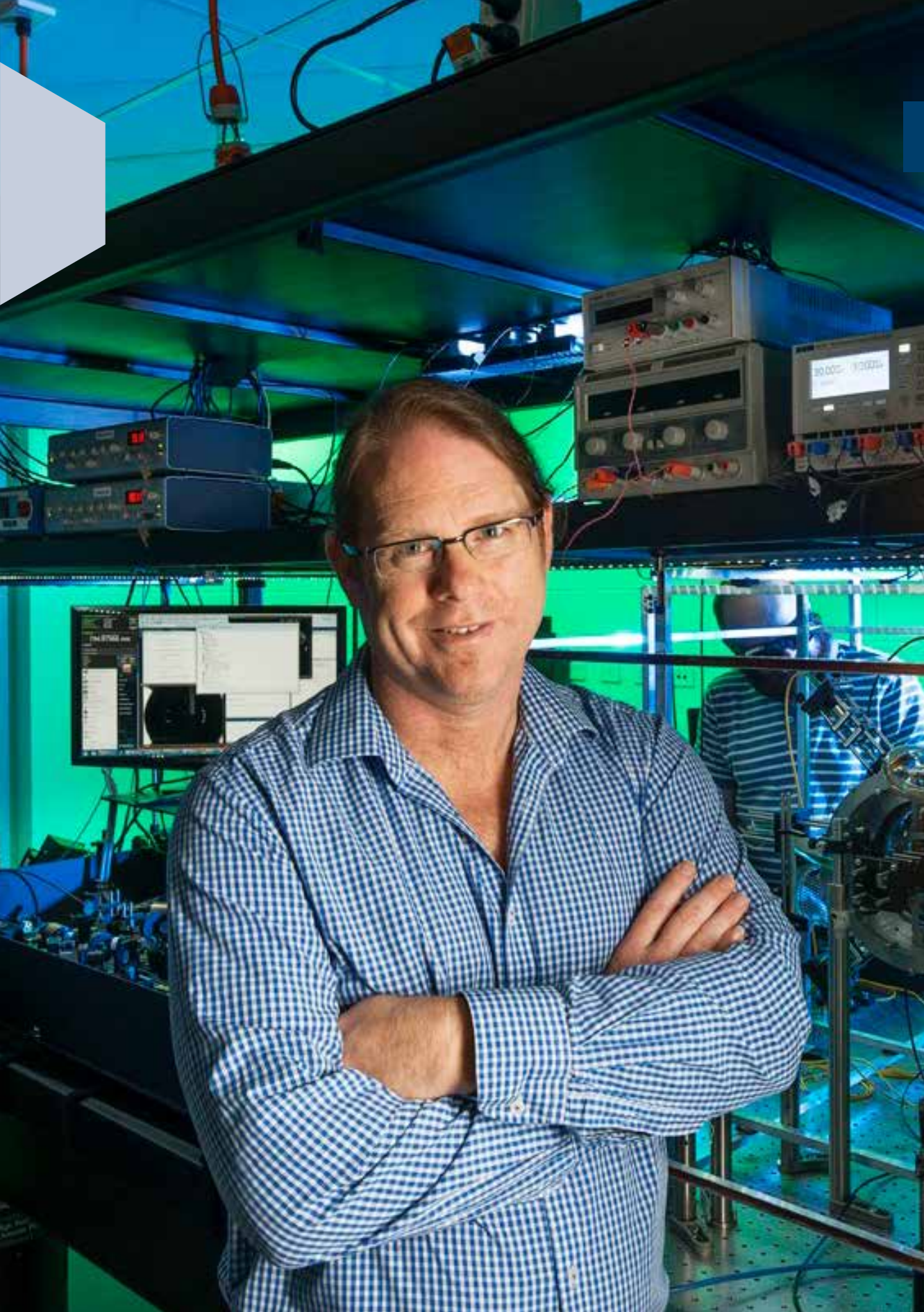
27 February 2020: The Defence Innovation Hub reached over $200 million of investment, with a $492,000 contract awarded to Penten for data protection technology. If successful, this technology will provide increased protection of information that is processed, stored and transmitted from portable electronic devices.

19 March 2020: The 2020 Australian Defence Sales Catalogue was released. 170 Australian businesses featured in the catalogue showcasing Australian products, technology and services available for export.

May 2020: Government announced the delivery of 50 grants totalling over $24.8 million since the launch of the Sovereign Industrial Capability Priority Grants program, awarded to Australian businesses contributing to one or more of the Sovereign Industrial Capability Priorities.

4 May 2020: More, together: *Defence Science and Technology Strategy 2030* was launched by Minister for Defence, The Hon Linda Reynolds CSC.

9 June 2020: The CDIC launched the Defence Industry Insights webinar series.



NEXT GENERATION TECHNOLOGIES FUND

The Next Generation Technologies Fund will create a research portfolio aligned with Defence priorities to deliver world-class science and technology capabilities

Program performance for the NGTF is reported over the following pages. Strategic measures are reported qualitatively and supported by quantitative performance information.

NEXT GENERATION TECHNOLOGIES FUND

NEXT GENERATION TECHNOLOGIES FUND IMPACT STATEMENT

The NGTF is creating a national research base closely aligned with Defence priorities that will deliver capability for the 2030 Defence Force and beyond. The NGTF is addressing a wide range of Defence's science and technology challenges, from the threat of improvised devices to achieving self-reliance in space. It is facilitating unprecedented collaboration between Defence, industry and academia and attracting partners that may otherwise have remained undiscovered.

2019–20 summary

There was considerable activity in the Defence innovation space over the 2019–20 financial year, with the continued growth of NGTF programs and the launch of More, together: *Defence Science and Technology Strategy 2030*.

MORE, TOGETHER

The *More, together* Strategy is closely aligned with the objectives of the NGTF. Both are aimed at harnessing the knowledge and expertise of the national S&T enterprise to deliver Defence capability.

A central element of the strategy is the STaR Shots program, eight research 'missions' addressing the key S&T challenges and opportunities confronting Defence into the future. The STaR Shots program supports the outcomes of the NGTF by ensuring that there is clear focus on problems of critical importance to Defence and that there is an identified pathway from research to capability.

- Agile Command and Control – Through faster and superior decision-making, enabling the Australian Defence Force (ADF) to deliver synchronised effects across all domains and operational levels.
- Battle-Ready Platforms – Achieving the timely and sustained presence of critical warfighting functions in contested environments.
- Disruptive Weapon Effects – Delivering game-changing innovations in weapon technologies to disrupt multi-domain combat and change the way we shape, deter, deny, contest and fight.
- Information Warfare – Delivering information warfare capabilities integrated across human, information and physical dimensions to allow the ADF to fight in and through contested information environments.
- Operating in CBRN Environments – Enabling the joint force to operate safely and effectively in contested chemical, biological, radiological and nuclear (CBRN) threat environments.
- Quantum-Assured PNT – Ensuring the ADF and its coalition partners can operate in complex and contested environments with uninterrupted access to position, navigation and timing (PNT) information.
- Remote Undersea Surveillance – Securing Australia's maritime interests through the provision of persistent and responsive undersea domain awareness.

- Resilient Multi-Mission Space – Providing resilient space-based services direct to the warfighter to enable the ADF to prevail in increasingly contested operating environments.

The *More, together* strategy will play a significant role in shaping the national innovation enterprise towards priority problems, and the NGTF remains the Australian Government's principal vehicle for identifying and pursuing technology areas that are critical for Defence. It is intended that the science and technology priority areas of the NGTF will continue to grow and form the building blocks for the STaR Shots.

IMPACT OF COVID

The full impact of COVID-19 on the activities of the NGTF is still emerging as the program works closely with partners to understand the effect on activities and learns to adapt.

In line with local government requirements, a number of engagement activities, such as the Cyber Summer School initiative, were cancelled or postponed. To ensure that all potential applicants had sufficient time to apply for calls open in the early stages of the pandemic, such as the Counter Improvised Threats Grand Challenge, the closing date for submissions was extended from its original date.

Despite COVID-19, all calls for proposals in the 2019–20 financial year were successfully completed and attracted a high number and calibre of responses.

Pandemic preparedness

COVID-19 demonstrated the importance of pandemic preparedness. Medical Countermeasures is one of the nine priority areas of the NGTF. A key activity in this area has been the establishment of the national Medical Countermeasures initiative (MCMi).

The MCMi, funded by the NGTF and CSIRO, was established under a strategic partnership with the DMTC Ltd. It is responsible for building sovereign industrial capability and sovereign resilience for prevention, preparedness, response and recovery in relation to chemical, biological and radiological events.

To meet the requirement for novel vaccines, therapeutics and diagnostics against Defence and health security threats, the MCMi leads and manages translational research projects on behalf of the whole-of-government stakeholder group.

A national capability audit undertaken by the MCMi in 2017 established a roadmap of medical countermeasure assets, infrastructure, manufacturing and skills. During the COVID-19 pandemic, this roadmap played a critical role in guiding rapid strategic investment for the national health response.

GROWTH IN COLLABORATIONS AND PARTNERSHIPS

To address the full range of its science and technology challenges, the NGTF has an operating framework that includes:

- large-scale collaboration vehicles, such as Grand Challenges and Defence Cooperative Research Centres (CRCs)
- medium-scale partnering arrangements, such as university research networks and strategic partnerships
- lightweight technology acceleration mechanisms, such as Small Business Innovation Research for Defence, the Defence Research Accelerator, and technology futures and foresight.

In 2019–20, the NGTF expanded its collaborations across the full spectrum of these partnering arrangements, building on foundational partnerships and bringing together industry, academia and publicly funded research organisations to work with Defence scientists.

Through an ongoing outreach and engagement program including national roadshows, participation in major trade shows and visits to individual institutions, Defence continued to raise awareness of the NGTF and strengthen connections with the research community.

In the reporting period, the NGTF added 68 activities, worth more than $36 million, bringing the total number of collaborative agreements under the NGTF to more than 237. These collaborative activities included:

- a new Grand Challenge in Multifunctional Apertures
- inclusion of an additional partner in the Hypersonics Grand Challenge
- new research networks in Intelligent Decision Superiority
- expansion of the Quantum Technologies Research Network
- expansion of the Human Performance Research Network
- an Exploratory Research Network in human biotechnologies
- the commencement of the Australia–United States Multidisciplinary University Research Initiative (AUSMURI) project in neuroautonomy
- participation in the Future Battery Tech Cooperative Research Centre
- renewal of the strategic partnership with Data61
- the launch of Phase 2 of the joint SBIRD ‘A Joint Effort: Integrating Advanced Materials onto Military Platforms’.

CASE STUDY

Blood biomarkers and the Port Adelaide Football Club

The highs and lows of elite Australian Football League (AFL) players may hold a new key to enhancing the mental and physical wellbeing of Australia's service men and women. With $500,000 funding from the NGTF, The University of Adelaide has been working with the elite Port Adelaide Football Club players to study blood biomarkers of physical and mental agility.

As with elite football players, ADF members are at the peak of their mental and physical prowess. They work in high-stress, contested and fluid environments and are required to make split-second decisions. Their physical and mental conditioning plays a critical role in their holistic development (mind–body relationship) to optimise their performance and recover from injury.

The research entailed taking blood samples from players before and after training. The results showed strong biomarker links to physical performance and how the players performed on the mental agility tests. In other words, when a player did not perform at 100 per cent accuracy, this showed up in their blood results.

Director of the Australian Research Council Centre of Excellence for Nanoscale BioPhotonics and Head Researcher, Professor Mark Hutchinson, said the

results were robust in demonstrating cognitive and physical activity related to events in the blood – in particular, the link between cognitive distraction and exhaustion. He said the research team hoped to follow up the study with different populations, such as women, and to find ways of detecting the blood biomarkers less invasively without constant blood tests.

'This kind of knowledge would allow Defence to maintain and enhance the wellbeing of its members in determining operational requirements and performance needs. We are talking about precision wellbeing and better management of people in different military environments', said Professor Hutchinson.

The club's Head of Performance Dr Ian McKeown said the collaboration has brought joint benefits to Defence and the club.

'The research made a lot of sense for both parties,' he said.

'Professor Hutchinson's team created a methodology using the daily day-to-day training loads for an AFL player.

Our players were open to being part of research and are inquisitive people who want to make themselves better so they typically jumped on board with this study.

'The greatest tick from our debrief of the results has been that the guys are very highly tuned to what is going on within their bodies and the blood results helped predict that, which is incredible.'

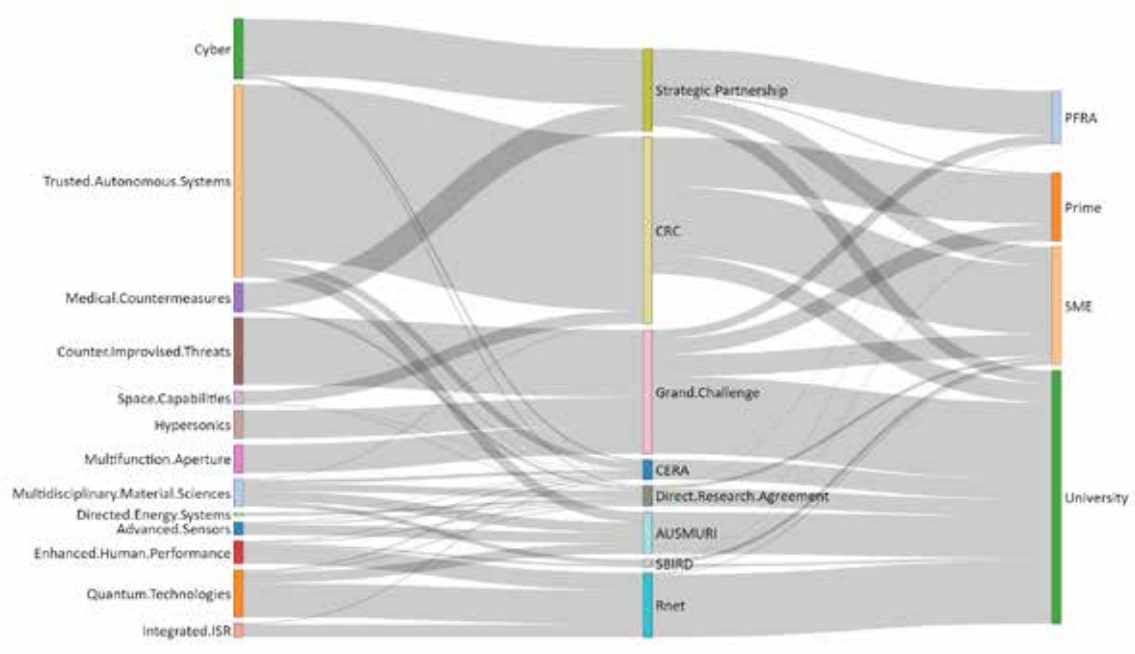
He said the discussions coming out of the initial results and the scope of the next stage of questions were enticing for the club.

'It's an area where sport science and human performance is at the forefront and our department and the staff want to be part of that. This research is pioneering. It's phenomenal and value adds to us in attempting to answer questions that have stumped us for a long time.

'The number one concern for us is our players' mental health and welfare. It is absolutely paramount because without that you can't have high-performing athletes.'

The continued growth of the programs under each of the NGTF priority areas has led to increased partnering opportunities across the innovation sector, creating networks and building a research base that is closely aligned with Defence priorities. The strategic partnerships and CRCs that the NGTF invests in also make significant investments in research in both the university and industry sectors. These partners play an important role in the NGTF program's engagement with the broader innovation ecosystem. These further investments and activities are not captured in this report beyond the graphic below.

The graphic below provides a breakdown of how each element of the innovation sector contributed to the priority areas in 2019–20 and through which engagement mechanism.



Building the knowledge base

Research undertaken under the NGTF is producing a world-leading knowledge base and a partnership network that will underpin the development of future capability in Defence. The knowledge generated is being used to gain a better understanding of key S&T challenges and opportunities for Defence. This is informing the creation of detailed technology roadmaps and guiding the subsequent development of the technology.

The development of a knowledge base forms part of a global Defence network that contributes to a comprehensive approach to ensuring Australia's safety and security. Global uncertainty and the COVID-19 pandemic have also highlighted the need for a strategic and integrated approach to joint cooperation that reduces duplication and is financially efficient.

BUILDING CAPABILITY AND CAPACITY IN THE AUSTRALIAN RESEARCH COMMUNITY

The NGTF priority area challenges are ambitious, broad and too numerous for Defence to deliver in isolation. Building capability and capacity in the Australian research community is a critical enabler in the efforts to deliver game-changing capabilities to the ADF. Defence has established a number of networks as a means to coordinate and align university capabilities nationwide with Defence priorities, and to tighten the connection between the university sector and defence industry.

From a program perspective, the research network construct brings together the best university researchers and capabilities to work with Defence research teams to address some of the fundamental scientific questions that define the NGTF problem space. A core research network objective is the development of world-leading and enduring research capacity and capabilities. Defence seeks to develop cross-institutional centres of world-leading knowledge generation and the capacity to apply that know-how to key Defence challenges as well as exporting it to target secondary applications in other markets both domestically and abroad.

Harnessing the university sector

Under the NGTF, Defence has partnered with state governments to establish state-based networks to coordinate and focus local academic and industry research and development on key Defence challenges. These existing entities are the Defence Science Centre in Western Australia, the Defence Innovation Partnership in South Australia, the Defence Innovation Network in New South Wales and the Defence Science Institute in Victoria. The Queensland Defence Science Alliance, established in May 2020, is the latest addition to this group The Queensland Defence Science Alliance is led by The University of Queensland and will be physically headquartered at Griffith University.

These networks collectively comprise the Australian Defence Science and University Network (ADSUN), which is supported by Defence to promote connection and engagement between the state-based

networks and with the broader national S&T ecosystem. ADSUN, through and with the state-based networks, facilitates university and small to medium enterprise (SME) access to Defence problem domains and assets.

Supporting the university sector

To date, the NGTF program has directly supported over 320 research personnel in universities alone. This support, and the involvement of this many experts in the NGTF, means that Defence is benefiting from the good ideas and talents of the sector. A key feature of many of the priority areas under the NGTF is the training and development of students, the future leaders of our nation's research sector. Almost all of the NGTF's activities fund students directly, and most provide indirect support. Initiatives such as the Australian Quantum PhD program and the Cyber Summer School more formally recognise the important role of students in growing the capability and capacity within priority S&T areas for Defence. In addition, the NGTF has funded the participation of over 80 students through Fund projects and scholarships. This is a significant contribution to the building of research capacity within the university sector.

UNSW Scientia Professor Andrea Morello, Dr Vincent Mourik and Dr Serwan Asaad who were part of a team who have discovered how to control the nucleus of a single atom using only electric fields. The discovery provides a new pathway to build quantum computers and quantum sensors. The work was funded through the NGTF and an Australian Research Council Discovery Project grant. Image: Lee Henderson/UNSW

CASE STUDY

Cyber Summer School

As cybercrime grows at an exponential rate, ensuring the safety of data is paramount. Attacks are becoming more determined and, more recently, are likely to be linked to other nation states. Our increasing reliance on digital networked systems to control systems and infrastructure requires the development of resilient measures and policies to ensure Australia's safety.

However, the threats to our safety also present opportunities. Enhanced attention to data security and the urgency of mitigating threats provide opportunities for cybersecurity professionals, government agencies, defence industries, universities and science students. Organisations such as Defence, the CSIRO and defence industry organisations, large and small, require a steady stream of new graduates to maintain research momentum, drive innovation and maintain Australia's competitive edge in a tough global economy.

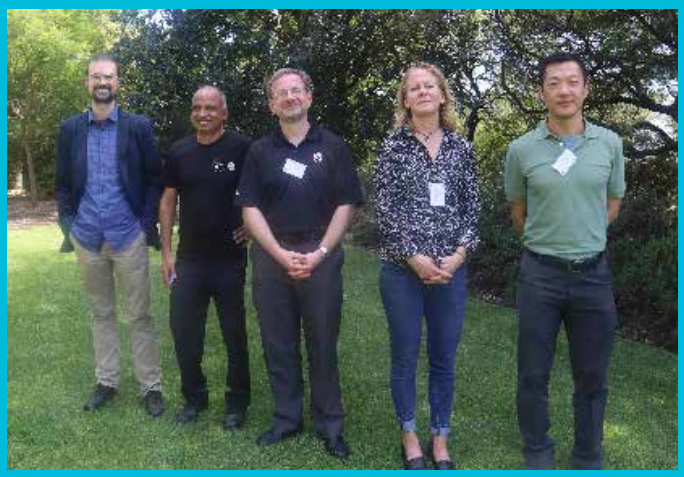
Recognising this, the NGTF and the CSIRO's Data61 collaborated with Australian universities in 2018 to establish the inaugural Cyber Summer School for postgraduate students.

The two-day program features a combination of blue-sky thinking and industrial and practical discussions. Leading national and international experts share their knowledge on cybersecurity topics and the latest developments in cutting-edge cybersecurity technologies.

Now in its third year, the Cyber Summer School is designed to inspire students, uplift Australia's cybersecurity research profile and drive a cohesive cyber network and ecosystem. About 150 PhD students, in varying phases of their studies, attend the school, which is held in different states. Twenty scholarships are provided to assist students to attend.

Several productive partnerships have developed from the networking opportunities the program provides. By emphasising the importance of collaboration, the NGTF and Data61 are answering the call for critical activity to develop knowledge and sovereign capability to overcome the cybersecurity challenges ahead.

While the global COVID-19 pandemic temporarily halted this year's program, planned for March 2020, plans are under way to host the school in 2021.



Left to right: Anton Uzunov (DST Group researcher and event co-organiser), Surya Nepal (CSIRO Data61, event co-organiser), with guest speakers Alexey Loginov (GrammaTech), Erin Kenneally (US DHS) and Wenke Lee (Georgia Institute of Technology) at the Cyber Summer School.

The Emerging Disruptive Technology Assessment Symposium (EDTAS) series is a key program that helps the NGTF future-proof Defence. The symposia consider broad S&T topics that are likely to impact the defence and national security domains over a 20+ year timeframe.

Defence partners with universities and industry to co-host these events and help shape strategic planning. An EDTAS symposium is a mix of leading-edge presentations, thought-provoking workshops and keynote presentations.

These symposia create opportunities for early collaboration in S&T areas and allow Defence to discover and recognise institutions and organisations within Australia that can help develop capabilities and provide tangible outcomes. The aim is to build sovereign defence capability and consolidate the national S&T ecosystem.

The symposia can identify future capability gaps and encourage discussion of potential overlaps between military needs and capability and commercial outcomes that benefit the broader community.

The initial unclassified symposium is followed by a data distillation and analysis phase and then an in-house classified working symposium, through which the results are explored through a future defence and national security lens.

Topics are aligned with, and help to shape future, priority areas for the NGTF. The 25 to 26 November 2019 EDTAS in Directed Energy for Defence and National Security was the sixth symposium. Previous symposia have covered other Next Generations Technologies Fund priority areas, including trusted autonomous systems; information, knowledge and digital disruption; advanced materials and manufacturing; human biotechnologies; and space technologies.

'Admittedly it's a big call, but EDTAS 2019 rates as the most professionally beneficial networking event I have ever attended – on any subject, in any country. It provided a forum to discover and meet with a broader range of domestic capability within the general field of directed energy than I was even aware existed. I have subsequently had professional interactions with several other attendees that I met at the event and being at EDTAS provided both mutual credibility and initial introductions.'

DR JAMES WEBB, CEO, PLATYPUS INSTRUMENTS PTY LTD

CASE STUDY

Emerging and Disruptive Technology Assessment Symposium – Directed Energy Technologies

The rapid development of potentially destructive and disruptive technologies creates significant global impacts for today's Defence forces and society. The Emerging Disruptive Technology Assessment Symposium (EDTAS) series is a key program that helps the NGTF future-proof Defence. This forum considers broad science and technology topics that are likely to impact national security over a 20+ year timeframe.

The 2019–20 EDTAS priority area was Directed Energy for Defence and national security. Directed energy technologies generate electromagnetic energy, which travels at the speed of light to produce localised disruptive or damaging effects. Directed energy technologies can include lasers, microwaves and charged particles.

The initial Directed Energy EDTAS was held in Sydney in November 2019 and considered high-energy lasers (HEL) and high-powered radio frequency (HPRF) systems. About 100 experts considered the key emerging directed energy issues, including developing an understanding of:

- the future evolution of directed energy sources
- the S&T challenges in developing directed energy systems and other issues associated with their integration into wider defence and national security systems
- the effects of directed energy systems on a wide range of Defence and civilian systems in order to provide protection
- how to protect individuals operating with or threatened by directed energy systems.

Defence has already developed a range of world-class HEL and national-class HPRF technologies. Following the symposium, Defence engaged with a defence industry SME and Australian universities on several projects.

The data distillation from the first symposium has now been completed and a broad call for real-world projects will be released in 2020.

Generating knowledge in priority areas

The NGTF seeks to further the Defence knowledge base through its growing partnerships. The knowledge generated creates value to Defence and its allies. By reducing duplication, both nationally and internationally, we reduce overspending and excess capacity, which are barriers to efficiency and procurement. S&T research with defence industries also supports the growth of a robust economy. The knowledge developed through these partnerships can then be furthered through initiatives such as STaR Shots, to ensure there are identified pathways from research to utilisation in solving priority Defence capability gaps.

To that end, the NGTF co-invests with international partners in initiatives such as the Australia–United States Multidisciplinary University Research Initiative (AUSMURI) and the joint Defence and Security Accelerator (DASA) SBIRD to deliver cutting-edge S&T while maximising international engagement across sectors and nations. Many of the priority areas also engage with international partners such as the Defence Advanced Research Projects Agency, the Air Force Office of Scientific Research, the Office of Naval Research Global and the Defence Threat Reduction Agency at the project level, leveraging knowledge and expertise in support of Defence priorities.

Described below are some highlights from projects that finished during the reporting period.

Counter improvised threat technologies transitioning to capability

The NGTF's Counter Improvised Threat Grand Challenge was established to develop and demonstrate an integrated system that can detect and neutralise improvised threats in a complex battlespace with minimal risk to Defence personnel and civilians.

Phase 1 of the challenge, much of which has been completed or is coming to a close, involved the research and development of detection and defeat concepts, technologies and algorithms. Coordinated and focused research into novel and new technologies has led to early success, with demonstrations of the potential capability of each of these technologies either having occurred or being planned.

Phase Two, which was due to start in the 2019–20 financial year but was delayed due to the COVID-19 pandemic, will build on these successes by focusing on developing an integrated system for detection, neutralisation and decision-making. It will culminate with a proof-of-concept demonstration of a counter uninhabited aerial system capability.

Progressing towards a Black Box for soldiers

In 2017, start-up telecommunications company Myriota and wearable technology company IMeasureU received $700,000 from the NGTF to develop the Fight Recorder. Envisaged as a 'black box' for soldiers, the Fight Recorder will be a soldier-worn device designed to capture valuable data on the battlefield for after-action review and analysis. It will act as an emergency beacon to reduce the time taken to reach and treat battlefield casualties and the data it captures will be used to inform the design and performance of soldier equipment and protective wear.

Currently, developers have been able to:

- record a soldier's movement and their GPS location using a single unobtrusive unit worn on the upper back
- reproduce movements (movement classifier, movement counter, abnormal movement value) by uploading recorded data to a custom portal
- display the GPS location when the emergency beacon is activated
- present a recent history of a soldier's location and activities on a digital map.

Advancing joining technologies for integrating advanced materials on military platforms

In 2018, as part of the Small Business Innovation Research for Defence (SBIRD) program, DSTG and the UK's Defence Science and Technology Laboratory launched 'A Joint Effort: Integrating Advanced Materials on Military Platforms'. This was a joint call from both the UK and Australia for innovative joining technologies that will enable the use of advanced materials on military platforms in land, sea and air environments.

The call was structured in two phases, with Phase 2 being launched in October 2019. Phase 2 provides an opportunity to build on the knowledge and lessons from Phase 1 and will progress promising technologies to higher technology readiness levels.

The Australian and UK DASA-SBIRD assessment team at the joint meeting in March 2020 in Melbourne to determine the Advanced Materials Integration applications.

The first phase of the project to support the development and integration of advanced materials into military platforms, completed in June 2020, resulted in the design and validation of shape memory alloy tufted carbon fibre composite joint laminates, which will be described in a future combined Australia–United Kingdom journal paper.

All projects under this SBIRD program have had extensive engagements between the collaborators in Australia and some of them have extended this to partners in the UK.

There has also been ongoing consultation about how to scale up the technology to greater readiness levels and to a potential industrial scale.

Several industry partners are part of the projects under this SBIRD. For example, QinetiQ Australia has partnered with RMIT University and used this as the pathway to develop closer ties with other Australian and international academic institutions, strengthening its ability to support Defence in Australia. Deakin University is exploring partnering with local composite manufacturers, such as Aerospace Composite Structures Australia in 3D composite repairs, which assists in underpinning future local capability to support defence needs.

One of the SBIRD Phase 1 projects produced a patent titled 'A method and patch for defect repairs'. This protection will allow the research provider, the University of Southern Queensland, to

'The Joint Effort call is an innovative approach to a collaborative partnership that has resulted in strengthening the relationship between Australia and the UK with both parties set to gain from the expertise in each nation... We believe that by coordinating UK and Australian resources in this way is a "first" and such an approach delivers cutting edge S&T whilst maximising international industrial engagement across both nations to provide exploitation routes and value for money.'

DR BRYN C. HUGHES, FBCS, FIET, TECHNICAL DIRECTOR, DSTL

participate further in the maturation of this concept. Phase 2, launched in October 2019, will progress promising technologies and demonstrate how the technologies will potentially enhance operational capability.

Developing Adaptive Camouflage

Until recently, camouflage that can adapt to its surroundings may have been considered science fiction, but under the NGTF three innovative adaptive visual camouflage technologies are positioned for transition to capability. These technologies will now be progressed to higher technology readiness levels, which will enable the systems to be further developed with industry and, ultimately, transitioned to Defence to provide an operational advantage.

This program also enabled greater collaboration between academia (The University of South Australia) and local industry (SYPAQ). The engagement enabled SYPAQ to collaborate in and provide skills to the program in electronic design, engineering and electromagnetic interference. The engagement enabled SYPAQ to use its commercial capabilities to address and provide solutions to a challenging problem responding to Defence capability needs.

CASE STUDY

Partnering for cyber security

Preventing cyber hacking is critically important for Defence and Australian society. One of the main goals of hacking into systems is to exploit software vulnerabilities and compromise computer applications for financial gain or exfiltration of sensitive data, or to force the system to behave in ways beneficial to the attacker. The simplest goal is to force the system to crash or fail and thereby deny service to the victim.

The search for software vulnerabilities is the modern equivalent of the gold rush. Commercially, hackers can earn upwards of a million dollars for finding a bug that can be exploited by a third party. For Defence, the risks could be catastrophic. The cybersecurity of software going into battle is just as important as the sturdiness of physical equipment like armour, flares and jet engines. Commanders going into battle must have confidence in the code on which their equipment operates.

However, as computer systems grow and physical assets connected to them become more interconnected, vulnerabilities multiply, and systems that are trustworthy and resilient become increasingly important.

Writing software is a complex job and there will always be vulnerabilities. Errors and vulnerabilities are also compounded because of the speed at which commercial software is being updated, sometimes on a daily basis.

Through the NGTF, Defence collaboration with Data61, Monash University, Swinburne University of Technology and DSTG has made important advances in algorithms to identify probable coding vulnerability locations.

The project's second phase, now under way, is using these tools as a step towards automatically determining the location and likelihood of vulnerabilities. Defence's initial algorithm research lead, Dr Paul Montague, said the researchers are also testing their tools so they can train the programs to self-learn and continue to find likely errors without human intervention.

'An important focus is to optimise the algorithms to reduce the number of false positives for the error detection, with current results showing better performance than those previously published in the literature. The ultimate aim is to provide Defence with algorithms which provide high accuracy, adaptiveness, robustness, and allow the addition of new capabilities,' he said.

CASE STUDY

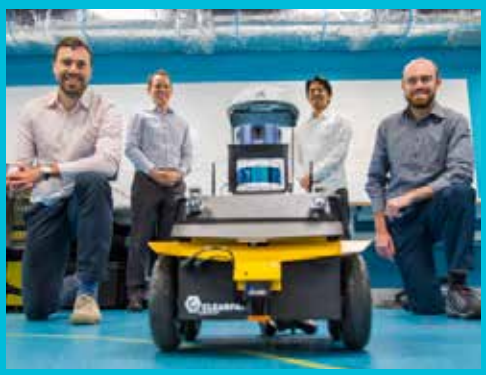
Rats and robots

The navigation skills of the humble rat are leading research into helping prevent robots getting lost. The problem is that unlike mammals and other animals, which have inbuilt skills to know their location, their pathways and how far they have travelled, robots do not always recognise where they may have been, even though they have previously mapped the area.

This has been a recognised problem for more than 30 years but it is one that needs to be solved if robots and other uninhabited vehicles are to work in rapidly changing and contested Defence environments.

Through the NGTF's AUSMURI program, Defence is working with Australian and international universities to develop next-generation robotics and autonomous vehicles (AVs) capable of learning on-the-run and functioning in novel environments.

Queensland University of Technology's (QUT) Centre for Robotics Deputy Director Professor Michael Milford is part of an Australian collaboration with DSTG led by The University of Melbourne, joined by QUT, Macquarie University and UNSW. Boston University, the Massachusetts Institute of Technology and the US Office of Naval Research make up the US side of the initiative. The project will run for three years.



Professor Milford said that while state-of-the-art AVs are trained for specific, well-structured environments, they would fail to operate in unstructured or contested settings.

'By using deep neurophysiological insights from the living world, we are developing new neuroscience-inspired methods capable of achieving advanced, next-generation perception and navigation for AVs,' Professor Milford said.

And this is where the rats come into their own. Professor Milford said rats are excellent navigators, even with their small brain.

'They can't see very well but they have exceptional smell and can when necessary navigate for many kilometres,' he said.

'Neuroscientists, including our collaborators, have found many scales of maps in the mammalian brain. Humans are able to visualise and have navigational memory of a local area, a map of the wider neighbourhood, the layout of the city and its location in relation to country and the world.

'By understanding and developing similar memory-guided behaviour in robots, we can produce AVs that will be able to respond and navigate in complex and unstructured environments, even when there is no computer, no access to the cloud and where they need to be self-reliant.

'In this way, robots can complement people in exploring and navigating new places, providing the opportunity to put robots rather than humans in potentially dangerous situations, thereby saving lives.'

Professor Milford's team recently published collaborative work between QUT and Boston University as part of this project in the journal Biological Cybernetics.

Research fellow Dr Tobias Fischer, QUT Centre for Robotics Deputy Director Professor Michael Milford, PhD students Mr Marvin Chancán and Mr Stephen Hausler in their laboratory with their test robot.

Capturing the growing pool of knowledge

Defence is increasingly drawing on the research and innovation ecosystem across Australia to enhance its ability to defend the country and our national interests. The NGTF is one of a number of mechanisms that Defence uses to harness the skills and expertise of the innovation network to ensure the best possible outcomes for Defence and Australia more broadly.

Research conducted through Fund programs is producing a pool of knowledge within Australia that will underpin the development of technologies with the potential to support future Defence capability and benefit society more broadly.

PROPERLY PROTECTING INTELLECTUAL PROPERTY

Defence has a responsibility to protect the information and intellectual property generated or exchanged through research collaborations, while at the same time ensuring that there is proper scrutiny of the research and its outcomes.

Collaborative research activities and their outcomes are protected through a number of security policies and frameworks to ensure that sensitive research, technologies and capabilities are properly safeguarded early in the research and innovation cycles.

ENABLING SCRUTINY AND ENSURING SCIENTIFIC RIGOUR

To ensure scientific rigour and demonstrate the quality of the work, research is, where possible, published in peer-reviewed journals, presented at relevant conferences around the world and secured in patents. Not only does this enable scientific scrutiny, it also plays a role in contributing to and stimulating knowledge growth in other areas, which may, in turn, produce intangible spin-off benefits.

ENGAGING WITH THE RESEARCH COMMUNITY

A series of forums, symposiums and workshops is conducted to promote awareness of the NGTF, bringing together Defence, small businesses, Defence primes, universities and publicly funded research agencies. These events create opportunities for exchanging information and building professional networks. Participants are informed about Fund initiatives and encouraged to explore collaboration and partnering opportunities.

The Innovate in Defence website has been particularly successful in complementing these activities, serving as an accessible means of informing prospective partners about opportunities for engagement.

SCINDICATE 2019

As Defence's primary science and technology partnering event, SCINDICATE brings together experts from science and industry to pursue a shared interest: delivering enhanced capability for Defence. The event provides attendees with an opportunity to engage with key figures from Defence, industry and the wider research sector with a view to exploring opportunities for increased collaboration.

Defence hosted SCINDICATE 2019 from 15 to 16 August 2019 in Edinburgh, South Australia, welcoming more than 800 delegates.

SCINDICATE provided attendees with an opportunity to hear about the current status of the NGTF program and outcomes achieved to date. Speakers also provided an insight into how the program will be harnessed to help Defence meet its S&T objectives in the future.

SCINDICATE presentations included:

- Exploring the NGTF. This included panel discussions and Q&A sessions with the NGTF priority area leaders, chaired by the Chief of Science Strategy and Policy Division, Dr Todd Mansell.
- Defence Innovation System Update. This combined experience gained through the NGTF, Defence Innovation Hub and Centre for Defence Industry Capability in a presentation about the successes of these initiatives so far and what the future holds.
- Quantum Research Program Update. Under the Quantum Technologies priority area of the NGTF program, Defence is seeking to develop leap-ahead technologies in quantum sensing, quantum timing and quantum communications. Quantum priority area leader Dr Anthony Szabo explored several partnership vehicles, including the newly created Quantum Research Network and support for two ARC Centres of Excellence – the Centre for Quantum Computing and Communications Technologies and the Centre for Engineered Quantum Systems.
- CRC Updates. SCINDICATE 2019 also featured presentations from the SmartSat CRC and the Defence CRC for Trusted Autonomous Systems. These strategic partners gave overviews of their respective programs, including partnership models and a project case study. SCINDICATE 2019 also provided the opportunity to engage with partners and improved our shared security culture, as well as consulting on the development of the More, together strategy and STaR Shots.

2019 Pacific International Maritime Exposition (PACIFIC 2019)

The 2019 Pacific International Maritime Exposition (PACIFIC 2019) was held in Sydney from 8 to 10 October 2019. The NGTF was represented at this major exhibition on the Defence Innovation System stand.

DEFENCE RESEARCH ACCELERATOR

PACIFIC 2019 played host to the largest ON Prime:Defence cohort to date. The 20 participating teams and 11 alumni teams represented 28 research organisations and commercial partners coming together from every state and territory.

Participants heard from a defence industry discussion panel, offering insights into what it is like to work with Defence and an understanding of how industry collaboration can help them achieve a pathway to impact. The teams also had a chance to pitch their science and technology solutions to a Defence and industry audience.

SMALL BUSINESS INNOVATION RESEARCH FOR DEFENCE (SBIRD)

The joint Australia and UK SBIRD information session, and official launch of Phase 2, was held at PACIFIC 2019 on 8 October and was open to all exhibitors, trade visitors, conference delegates, media and invited guests.

The information session provided a technical brief on aspects of the topic; a video contribution from the Materials for Strategic Advantage (MSA) program in the UK outlining the UK technical perspective; a video briefing from the Defence and Security Accelerator (DASA) on how to apply for funding within this and other competitions; and the opportunity to ask questions.

The session was attended by representatives of about 20 industry organisations and many follow-up enquiries were received afterwards.

Professor Tanya Monro, Chief Defence Scientist speaks at the Sea Power and the 4th Industrial Revolution – Science, Technology and Industry seminar, Sea Power Conference 19 at the International Convention Centre, Sydney.

CASE STUDY

Accelerating Research with ON Prime:Defence

ON Prime:Defence is a partnership between the CSIRO ON Accelerator program and the Defence Research Accelerator within the NGTF.

The pre-accelerator experience is designed to foster innovative science and technology that has the potential to deliver game-changing capabilities for Australia's national security and defence. The 8-week program helps research teams validate their value proposition for real-world applications in both the Defence and commercial markets. These activities are designed to enable participants to build connections with Defence and to give them a vision of a way forward for their research.

To date, 54 research teams have taken part in ON Prime:Defence. A further 17 projects have gone through Defence LaunchCamp, a two-day introductory version of the program. This has resulted in 189 researchers now being equipped with the knowledge to validate the value proposition of their work within the defence and national security sector and has led to 12 new ventures being created by the program's participants.

Through engagement with Defence mentors and the delivery of three Defence Day events – including the one hosted at PACIFIC 2019 – participants have been introduced to the Defence innovation system and connected directly with Defence and defence industry personnel.

Given that 74 per cent of participants in the most recent cohort had not previously worked with Defence, the program undoubtedly presents many opportunities for researchers who would not otherwise have considered Defence pathways. At the same time, ON Prime:Defence connects Defence and defence industry to innovative S&T with the potential to provide game-changing technology for the ADF.

Due to changes in the CSIRO ON Accelerator program, the NGTF is looking at how to take the best aspects (and the lessons learned) from the ON Prime:Defence program and evolve it to better address the requirements of the research, start-up and SME segments of the innovation system. The Defence Research Accelerator will continue to provide support and encourage the growth of ideas and concepts to deliver game-changing capability to Defence.

Targeted engagement activities

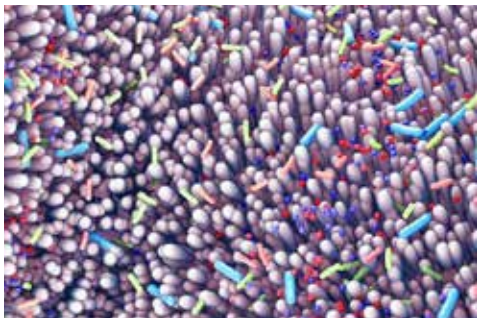
In addition to participation in major events such as SCINDICATE and PACIFIC, the NGTF continues to build broad awareness of its programs and priorities throughout the innovation sector by leading and participating in smaller workshops, meetings and conferences that focus on specific priority areas.

Examples from the 2019–20 financial year included:

- the launch and inaugural meeting of the **Quantum Research Network** in Adelaide from 15 to 16 July 2019, providing an important networking opportunity for partners
- the 2019 **Human Performance Research network (HPRnet) Symposium**, held from 21 to 22 November 2019 at the University of Canberra in conjunction with the Defence Human Sciences Symposium (DHSS).

The HPRnet symposium drew close to 150 attendees over two days, and focused on establishing a broader national capability with the breadth and capacity to meet Defence's future needs. Attendees took advantage of the opportunity to network with colleagues from across the research community and Defence and learned about the latest developments in the field.

- An Integrated Intelligence, Reconnaissance and Surveillance priority area workshop was held on 18 July 2019 with about 15 external participants to encourage inter-agreement relationships between the six initial automated processing and reasoning agreements. A similar workshop was held on 25 June 2020 with about 20 external participants for human and artificial intelligence (AI) interaction.
- The Precision and Quantum Sensing workshop was convened by the Advanced Sensors priority area from 18 to 20 November 2019. There were 87 attendees, 11 of which were international. A mini-workshop run at PQS on quantum sensing contributed to the development of the CSIRO Quantum Roadmap that was released in May 2020.
- An overview of the NGTF priorities and program was also represented at the Defence Innovation Hub Annual Industry Conference that took place on 4 November 2019 in Canberra. A presentation at the conference covered the current status of the program and opportunities to participate, while visitors to the NGTF stand had the chance to learn more about the program's activities.



Human gut microbiota:

Stress can negatively impact the gut microbiome and affect gut health. The NGTF Enhanced Human Performance priority area is undertaking work on the factors that affect cognitive and physical function and what changes occur in the microbiome as a result of military stress.

Next Generation Technologies Fund operating framework

Defence has developed an operating framework for the NGTF, informed by analysis of successful innovation programs across the world, with the best being adapted to suit the Australian defence context.

Partnering options through the framework allow choice and flexibility in scale and time-to-delivery for research program design – from ambitious Grand Challenges to lean and focused technology acceleration. This allows Defence to engage a range of research partners, individually or in teams, from start-ups to primes and national research organisations.

The S&T priorities and challenges addressed through these collaborative vehicles are continuously informed by investigations of emerging technology and technology futures and foresight.

Partnerships and collaboration vehicles include:

- Grand Challenges
- Defence Cooperative Research Centres
- University Research Networks
- Strategic Research Program
- Small Business Innovation Research for Defence
- Defence participation in national technology accelerator programs.

GRAND CHALLENGES

Grand Challenges provide the scale and intensity required to tackle formidable challenges that have no simple solutions. The design of the Grand Challenge program has been influenced by the US Defence Advanced Research Projects Agency (DARPA), Grand Challenges Canada and the Bill and Melinda Gates Foundation. Participation by academic institutions, publicly funded research agencies, agile small companies, larger Defence primes and Defence itself is essential to ensure optimal outcome delivery.

DEFENCE COOPERATIVE RESEARCH CENTRES

Defence Cooperative Research Centres (CRCs) are Defence-focused, industry-delivered collaborative programs that draw on the leading national research capabilities of universities, industry and publicly funded research agencies. This program builds on the successful national CRC model, with some modification in that it has a mission-driven focus. Each Defence CRC has specific goals and objectives that align with Defence needs. Research projects are only supported if they have an identified pathway for adoption by Defence.

As with the other NGTF programs, Defence CRCs improve the research skills and capabilities of participants and increase small company engagement in collaborative research. The goal is to make the Australian defence industry more efficient, productive and competitively priced.

UNIVERSITY RESEARCH NETWORKS

The NGTF is shaping the national innovation enterprise into targeted university research networks. It is advancing cross-disciplinary research and building academic communities across Australia and around the world. Built on open partnerships and mutual investment in the academic domain, these technology-based networks provide a robust mechanism to bring leading

'Fundamental research has always been global in nature, and some of the most creative and innovative ideas in basic research spring from collaboration – both across disciplines and across geographic boundaries. The US Department of Defense's (DoD) Multidisciplinary University Research Initiative Program has a long and proud history of supporting teams whose members have diverse sets of expertise as well as radically different approaches to tackling a scientific question at the heart of fields important to the DoD's future capabilities. I am delighted that the Australian Department of Defence has joined with us and that we have together developed the Australia – US MURI program that introduces further diversity of expertise and approaches to complex problems. These joint MURI projects accelerate research progress and enable breakthroughs by the cross-fertilization of ideas – ideas that can be further developed and transitioned quickly by both of our countries. This program extends the long history of collaboration between Australia and the US, and paves the way to more and even deeper basic research connections between our two countries.'"

DR BINDU NAIR, DIRECTOR – BASIC RESEARCH, OFFICE OF THE UNDER SECRETARY OF DEFENSE FOR RESEARCH AND ENGINEERING, USA

research teams together to address defence priorities with a strategic focus led by Defence.

In addition to these technology-based university networks, a significant university collaboration initiative is the Australia–United States Multidisciplinary University Research Initiative (AUSMURI).

AUSMURI enables Australian and US universities to partner in an existing US program (the Multidisciplinary University Research Initiative (MURI)) and undertake research on focused topics of high priority for the future defence capabilities of both countries.

The AUSMURI program allows Australian researchers to remain in Australia and develop capability in key areas of science, while at the same time benefiting from working with the best US universities. The NGTF funds only Australian universities, while the US Department of Defense provides funding to participating US research institutions, promising a valuable return on Australia's investment.

ADSUN also brings academics and Defence scientists together to collaborate on future leap-ahead technologies. The networks are co-funded by state governments and build on the success of the Defence Science Institute (DSI) model established in Victoria. Networks have now been established in South Australia (Defence Innovation Partnership), New South Wales (Defence Innovation Network), Western Australia (Defence Science Centre) and Queensland (Queensland Defence Science Alliance).

STRATEGIC RESEARCH PROGRAM

Where initial investigation of a new concept or technology shows the potential for disruption, the research activity may be scaled up and further focused to develop technology of particular importance for Defence, drawing on partners from across the innovation enterprise.

SMALL BUSINESS INNOVATION RESEARCH FOR DEFENCE

The SBIRD program is modelled on international initiatives such as the longstanding and successful Small Business Innovation Research program in the USA and the Small Business Research Initiative in the UK. SBIRD is targeted at engaging small business to conduct early-stage, high-risk, high-payoff research with the potential to mature into defence capability. Funded activities run in two stages:

- researching the feasibility of a potential Defence technology over a six to nine month period
- evaluating the technology in the context of the specific Defence application, with promising results evaluated for transition through the Defence Innovation Hub.

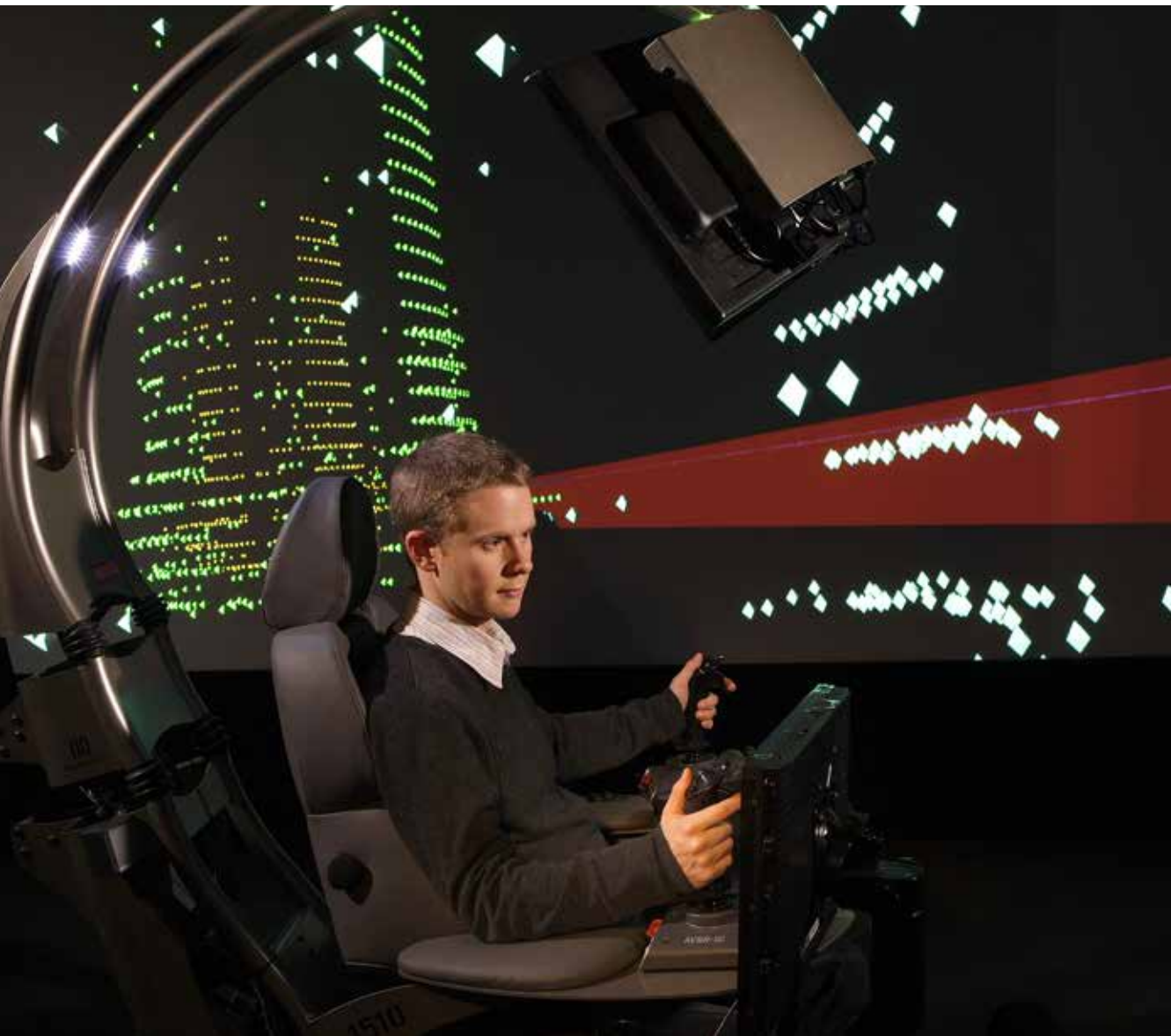
Defence accelerator program

A new generation of innovators is developing breakthrough products without the huge capital cost traditionally required for cutting-edge research and development. This agile approach leads to technology disruption, where inventions of new processes, products or systems are rapidly developed and applied to known problems in unexpected ways. Bringing

this inventive approach to the market for defence and national security products improves capability outcomes. This program works with existing accelerators within the national innovation system, such as CSIRO's ON Prime program, which supports the start-up community with an interest in defence.

Technology futures and foresight

Defence conducts ongoing horizon scanning to inform the S&T priorities addressed by the NGTF. The purpose is to understand emerging science and technology areas across a broad spectrum over a 10 to 20-year span.



PRIORITY AREAS FOR DEFENCE

Through the NGTF, Defence is continuing to build a portfolio of research with investment in all science and technology areas agreed as priorities for Defence. These priorities are shaped by:

- technology foresight as part of the annual Force Design process
- assessments of emerging threats
- the strategic directions set out by the Chiefs of Service in their long-term planning documents.

The identified priorities currently remain as stated in the *2016 Defence Industry Policy Statement*.

The cumulative investment made[1] in each priority technology area is shown below as a percentage of the total investment made to the end of the reporting period. The cost of delivering and assuring the NGTF remains within five per cent of overall funding.

Trusted Autonomous Systems	*(34.7%)*	*Multidisciplinary Material Sciences*	*(5.0%)*
Countering Improvised Threats	*(12.1%)*	*Enhanced Human Performance*	*(4.1%)*
Cyber	*(11.1%)*	*Integrated ISR*	*(2.6%)*
Quantum Technologies	*(8.6%)*	*Space Capabilities*	*(2.5%)*
Medical Countermeasures	*(5.2%)*	*Advanced Sensors*	*(2.3%)*
GC: Multifunction Aperture	*(5.1%)*	*Technology Foresighting*	*(1.0%)*
GC: Hypersonics	*(5.1%)*	*Directed Energy Systems*	*(0.6%)*

Total investments made per priority technology area to date

INVESTMENT IN TECHNOLOGY PRIORITY AREAS

The scale and nature of each initiative is a consequence of the investment context outlined above, taking into account, for example:

- partnering goals
- the maturity of Defence's understanding of the research needed in each area
- the research community's readiness to participate.
- The NGTF initiatives under way are mapped into the Defence S&T priority areas below.

Research theme	Summary of investment to date
Cyber	The theme is developing advanced capabilities to support Defence requirements in: cybersecurity; defensive cyber operations; intelligence; and effects. The theme is investing in the following research themes: trustworthy and resilient systems; situational awareness; mission assurance; threat countermeasures and effects; cyber artificial intelligence and autonomy; and the human element. The cyber theme has, to date, included the following investments areas. • A Strategic Partnership Agreement (SPA) with Data61. • A research agreement with University of Sydney to progress a distributed, parallel architecture for the 'Magma' cryptologic analysis software. • Competitive Evaluation Research Agreement (CERA) projects to progress knowledge on topics such as satellite communications networks, mission assurance, information security and electronic warfare. • Provision of a secure collaborative cyber research facility at Lot 14. • The appointment of a Chair in cyber security at the University of Adelaide. • AUSMURI research into 'Cyber Autonomy through Robust Learning and Effective Human/Bot Teaming'. The theme has engaged seven primary partners – CSIRO Data61 and six Australian universities.

Research theme	Summary of investment to date
Space capabilities	The theme is investing in cutting-edge science to transform Australia's space innovation for defence and national security. The Space capabilities theme has invested in the following significant activities to date. • The SmartSat Cooperative Research Centre, in which Defence is a major partner. SmartSat is a $245M, 7-year program that aims 'To be recognised as the leading contributor in transforming Australia's space innovation ecosystem for our future prosperity'. Defence provides program governance through a Defence and National Security End User Advisory Board that includes Defence, industry and academic stakeholders. • Competitive Evaluation Research Agreement (CERA) projects exploring the design of a space-based, low-power star tracking system and integrated (wide-field space event detection and precision tracking) space situational awareness (SSA) from distributed optical sensors. The primary partners have been the SmartSat Cooperative Research Centre, three Australian universities and an industry partner, Myriota.
Advanced sensors	The theme is enabling the development of the below-water and above-water sensors needed for the remote surveillance of the undersea environment by establishing: • a strategic national capability in advanced piezo-electric materials, including an industrial capability to manufacture and design advanced sonar sensors • a world-class body of expertise within the Australian research sector on emerging precision magnetometry (and quantum sensing) technologies and their defence application • a sovereign capability in advanced single-photon detection and classification technologies. The underpinning technology may also be applicable to precision navigation and timing (PNT) and will provide potential spinoffs in the medical countermeasures and enhanced human performance priority technology areas. The priority area has engaged seven lead primary partners. The University of Tasmania partnership is under a pilot Multidisciplinary University Research Initiative with US universities.

Research theme	Summary of investment to date
Hypersonics	The theme is undertaking collaborative research to understand the science behind hypersonic flight – including propulsion, flight dynamics, control surfaces and materials that support flight systems. The theme is conducting its research through a Grand Challenge vehicle, with four lead partners supporting the effort: the University of Southern Queensland, The University of Queensland, The University of Melbourne and an international company, German Aerospace Centre (DLR).
Directed energy capabilities	This theme is innovating, leveraging and growing Australia's expertise in directed energies to provide a competitive advantage for the Australian defence industry and ADF's combat advantage in multi-domain for different military applications to achieve strategic, operational and tactical effects. The theme has invested in the following programs. • An exploratory research network with eight lead universities and an industry partner, Aether Photonics, to explore advanced laser technologies and high-power radio frequency technologies. • A Competitive Evaluation Research Agreement (CERA) project with Macquarie University exploring directed energy concepts based on fibre laser pumped diamond. The Grand Challenge to counter improvised threats also includes research in advanced directed effectors.
Quantum technologies	This theme is investigating the application of quantum technologies to defence and national security. The theme has been leveraging Australia's and international capabilities to establish the following initiatives. • A Quantum Technologies Research Network involving eight lead Australian universities and one industry partner, QuintessenceLabs, exploring a number of research questions. • An AUSMURI project at Griffith University focusing on the validation and verification of the spectator data qubit systems. • An ARC Quantum Centre of Excellence for Quantum Computation and Communication Technology and an ARC Centre of Excellence for Engineered Quantum Systems. • Cooperative Evaluation Research Agreement (CERA) projects generating insights into quantum satellites and inertial navigation systems with three lead university partners.

Research theme	Summary of investment to date
Integrated ISR	The Integrated ISR theme seeks to develop effective enterprise ISR integration and interoperability with our allies to provide a capability edge through superior battlespace awareness. The theme is progressing research through the following programs. • An Intelligent Decision Superiority Research Network in Automated Processing and Reasoning involving five lead universities and one industry partner, Acacia Systems Pty Ltd. • An Intelligent Decision Superiority Research Network in Human-AI Interaction, currently involving five lead university partners and Lockheed Martin. • An Intelligent Decision Superiority Research Network in Multi-Domain Distributed Networks currently involving six lead universities. • Competitive Evaluation Research Agreement (CERA) projects with four universities (completed). The Grand Challenge in multifunctional apertures also includes research relevant to this priority area.
Trusted autonomous systems	This theme seeks to transform ADF operations with new and enhanced capabilities through the application of trusted autonomous systems. The theme has invested in the following programs to date. • Competitive Evaluation Research Agreement (CERA) projects with nine universities in machine cognition, persistent autonomy and human/autonomy integration. • A partnership with an industry partner, Solinnov, to examine sensor integration and health and usage monitoring systems (HUMS) integration. • A neuro-autonomy AUSMURI project with The University of Melbourne with the aim of developing new biological and engineering insights into principles governing navigation, spatial awareness and perception in animals and machines. • The first Defence CRC for Trusted Autonomous Systems.

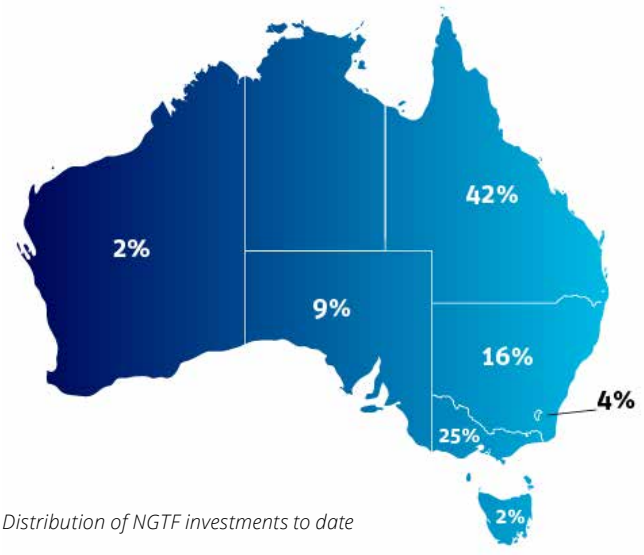
Research theme	Summary of investment to date
Enhanced human performance	This theme seeks to leverage the research strengths in the field of enhanced human performance to deliver a capability edge for the ADF in the areas of personnel selection, preparation and performance for current and future missions. The research activities have consisted of the following activities. • Competitive Evaluation Research Agreement (CERA) projects with three lead universities exploring improvements to air combat modelling, software tools for operators and human agent teaming language requirements. • An Exploratory Research Network with three lead universities to research state-of-the-art information in selected human biotechnology areas that were identified from conducting horizon scanning and technology forecasting activities. • The Fight Recorder SBIRD with industry partners iMeasureU and Myriota. • A Human Performance Research Network (HPRNet) with nine lead universities currently addressing the priority cognitive and physical human performance requirements identified by Defence and covering the operator life-cycle. • a microwave-assisted thermal sterilisation (MATS) project with The University of Tasmania
Medical countermeasure products	The medical countermeasure theme is establishing and coordinating a national infrastructure for the rapid development of medical countermeasure products to provide effective protection of Defence personnel from a range of chemical, biological and radiological threats, pandemics and emerging infectious diseases. Involving collaboration with five lead partners, the theme delivers on the following programs. • A Competitive Evaluation Research Agreement (CERA) project on novel bacterial sensors. • DMTC Strategic Partnership and an Exploratory Research Network that invests in research into antimicrobial resistance, point-of-care diagnostics and security-sensitive biological agents.

Research theme	Summary of investment to date
Multidisciplinary material sciences	The theme aims to provide the ADF with the ability to respond and field decisive capabilities that exploit/counter emerging or disruptive material technologies ensuring Defence capability that is sustainable, robust, affordable, available and survivable. The theme's main programs to date are: • the Adaptive Camouflage SBIRD project, which has engaged with several small and medium enterprises – including Dotterel Technologies, MicroTau, Simbiant and Xrotor – and one university in Australia to demonstrate adaptive camouflage concepts for small uninhabited aerial systems • the Additive Manufacture AUSMURI, with lead partner The University of Sydney, conducting fundamental research on additive manufacturing • Competitive Evaluation Research Agreement (CERA) projects with seven universities and an Exploratory Research Network with five universities, creating knowledge that will underpin the information on advanced materials needed for future defence platform design • a Material Joining SBIRD with four universities, CSIRO and Qinetiq focused on the development of technology that will accelerate the integration of advanced disruptive materials onto military platforms • a Future Battery CRC.

PARTNER PROFILES

To deliver the NGTF programs over its 15-year lifetime, Defence is establishing a wide variety of enduring research partnerships to develop the disruptive technologies needed to provide future Defence capabilities. During the reporting period these partnerships grew in number and profile. New research agreements commenced with 22 Australian universities and two companies as lead partners, in addition to new investments in strategic partnerships and CRCs.

In 2019–20, the National Innovation and Science Agenda (NISA) noted that, relative to many of its OECD peers, Australia ranked poorly in terms of levels of industry–research collaboration. The NGTF is one of a raft of Government initiatives that are redressing this national performance shortfall. Through teaming arrangements established under the Grand Challenge to counter improvised threats, through the medical countermeasure products initiative with DMTC and Defence CRC Trusted Autonomous Systems, and through smaller investments in the SBIRD program the NGTF is making a positive contribution to the national profile of industry–university collaboration. This will grow rapidly as other initiatives – such as the SmartSat CRC and research networks – are launched and mature.



Distribution of NGTF investments to date

University partners

Under the NGTF, partnerships with Australian universities vary in scale and breadth. Funding to individual universities since the launch of the NGTF has ranged from $100,000 to more than $5 million. Factors contributing to this variation include the breadth and depth of a university's engagement with Defence and the degree of alignment of a university's research capabilities with priority Defence research themes. Working from a position of impartiality, Defence is taking steps to ensure all universities that aspire to be partners under the NGTF can be competitive bidders. Every university with Defence interests has been assigned a senior Defence scientist to provide direct support as an S&T partnership manager. University-specific resources are also being developed

to help each university apply to NGTF initiatives.

Victoria, South Australia, Western Australia and New South Wales, joined during the reporting period by Queensland, have established institutes to encourage university-based defence research. Defence recognises the value of these state-based institutions in developing a truly national defence research enterprise, with support provided through the NGTF.

The following summary of each university's cumulative direct engagement in the NGTF portfolio includes support for state-based defence science institutes. Projects and funding are associated with lead university partners only; in some cases, other universities and industry partners are receiving a share of the funding through collaborative arrangements. Collaborations under the Strategic Partnerships with Data61 and DMTC or through investments in CRCs and ARC Centres of Excellence are not included in this table although many university partners will also be engaged through these entities.

Partner university	Priority technology area	Number of projects	Total investment
Australian Catholic University*	Integrated ISR	1	$95,000
Australian National University*	Quantum Technologies, Integrated ISR, Trusted Autonomous Systems	12	$4,080,000
Curtin University*	Directed Energy Systems, Space Capabilities	2	$193,000
Deakin University*	Integrated ISR, Multidisciplinary Material Sciences, Enhanced Human Performance	6	$597,000
Edith Cowan University	Cyber	2	$197,000
Flinders University*	Advanced Sensors, Integrated ISR, Counter Improvised Threats, Enhanced Human Performance	4	$1,371,000
Griffith University*	Quantum Technologies, Integrated ISR, Trusted Autonomous Systems	4	$3,405,000
La Trobe University*	Medical Countermeasures, Enhanced Human Performance	3	$725,000
Macquarie University*	Directed Energy Systems, Multifunction Aperture, Enhanced Human Performance	7	$1,115,000

Partner university	Priority technology area	Number of projects	Total investment
Monash University*	Multidisciplinary Material Sciences, Enhanced Human Performance	3	$365,000
Queensland University of Technology*	Directed Energy Systems, Integrated ISR, Multidisciplinary Material Sciences, Counter Improvised Threats	5	$1,159,000
RMIT University*	Quantum Technologies, Integrated ISR, Trusted Autonomous Systems, Multifunction Aperture, Multidisciplinary Material Sciences, Advanced Sensors, Enhanced Human Performance	17	$3,146,000
Swinburne University of Technology*	Integrated ISR, Enhanced Human Performance	2	$600,000
The University of Adelaide*	Cyber, Quantum Technologies, Integrated ISR, Trusted Autonomous Systems, Counter Improvised Threats, Multifunction Aperture, Directed Energy Systems, Multidisciplinary Material Sciences, Advanced Sensors, Enhanced Human Performance	28	$7,682,000
The University of Melbourne*	Hypersonics, Cyber, Integrated ISR, Trusted Autonomous Systems, Multifunction Aperture, Directed Energy Systems, Multidisciplinary Material Sciences, Quantum Technologies, Enhanced Human Performance, Medical Countermeasures	21	$13,116,000
The University of New South Wales*	Quantum Technologies, Integrated ISR, Multidisciplinary Material Sciences, Advanced Sensors, Enhanced Human Performance	6	$1,022,000

Partner university	Priority technology area	Number of projects	Total investment
The University of New South Wales, Canberra*	Cyber, Integrated ISR, Trusted Autonomous Systems, Directed Energy Systems, Quantum Technologies	8	$577,000
The University of Newcastle	Trusted Autonomous Systems	1	$100,000
The University of Queensland*	Hypersonics, Counter Improvised Threats, Directed Energy Systems, Quantum Technologies, Enhanced Human Performance	20	$10,154,000
The University of South Australia*	Cyber, Integrated ISR, Trusted Autonomous Systems, Counter Improvised Threats, Directed Energy Systems, Multidisciplinary Material Sciences, Quantum Technologies, Space Capabilities	10	$1,830,000
University of Southern Queensland*	Multidisciplinary Material Sciences, Hypersonics	2	$666,000
The University of Sydney	Cyber, Multidisciplinary Material Sciences, Integrated ISR, Trusted Autonomous Systems	8	$3,979,000
The University of Tasmania	Advanced Sensors, Enhanced Human Performance	3	$3,237,000
University of Technology Sydney	Integrated ISR, Multifunction Aperture	2	$218,000
The University of Western Australia	Counter Improvised Threats	1	$2,910,000
University of Wollongong*	Advanced Sensors, Multidisciplinary Material Sciences	3	$425,000
Victoria University*	Enhanced Human Performance	1	$512,000
Western Sydney University*	Space Capabilities, Enhanced Human Performance	3	$659,000
State-based University Research Networks (ADSUN)*		5	$5,821,000

** New agreement(s) in 2019–20*

Industry partners

The NGTF is supporting Defence innovation research across a broad spectrum of industrial entities. Partners include every category of business, ranging from small businesses with fewer than 5 employees to the Australian branches of Defence primes. In line with guidance from the *2016 Defence Industry Policy Statement*, emphasis has been placed on building collaborative programs with small and medium businesses.

A summary of each industry partner's direct engagement in the NGTF is given below. Projects and funding are associated with lead partners only; engagements under the NGTF program's Strategic Partnerships with Data61 and DMTC or through investments in CRCs and ARC Centres of Excellence are not included in this table although many more projects are supported through these mechanisms and initiatives.

SME industry partner	Priority technology areas	Number of projects	Value
Acacia Systems Pty Ltd	Integrated ISR	1	$100,000
Aether Photonics	Directed Energy Systems	1	$72,000
Certara	Medical Countermeasures	1	$409,000
DefendTex	Counter Improvised Threats	1	$2,089,000
Dotterel Technologies	Multidisciplinary Material Sciences	1	$99,000
iMeasureU	Enhanced Human Performance	1	$298,000
MicroTau	Multidisciplinary Material Sciences	1	$100,000
Myriota	Enhanced Human Performance, Space Capabilities	2	$580,000
Noetic Solutions Pty Ltd	Technology Foresighting	2	$1,660,000
Quintessence Labs	Quantum Technologies	1	$249,000
RFTeq Pty Ltd	Counter Improvised Threats	1	$2,364,000
Simbiant	Multidisciplinary Material Sciences	1	$95,000
Solinnov	Trusted Autonomous Systems	1	$180,000
Tectonica Australia	Counter Improvised Threats	1	$1,848,000
Xrotor	Multidisciplinary Material Sciences	1	$100,000

Prime industry partner	Priority technology areas	Number of projects	Defence investment
German Aerospace Centre (DLR)	Hypersonics	1	$2,177,000
L3 Micreo	Counter Improvised Threats	1	$1,061,000
Lockheed Martin Australia*	Integrated ISR, Counter Improvised Threats	2	$597,000
Teledyne Defence	Counter Improvised Threats	2	$823,000
Qinetiq*	Multidisciplinary Material Sciences	1	$146,000

** New agreement(s) in 2019–20*

Publicly funded research agencies and Strategic Partnerships

The NGTF is leveraging the expertise of Australia's national science agency, CSIRO, in a range of science domains and a variety of programs. CSIRO is a strategic partner and co-investor in two major multi-year initiatives:

- a research program in the domain of medical countermeasure products, conducted through DMTC
- a partnership in cyber with Data61.

As a component of the NGTF technology acceleration program, Defence is collaborating with CSIRO to run a defence-oriented stream in the NISA-funded national technology accelerator ON Prime. This gives researchers a unique opportunity to fast-track their S&T proposition with expert guidance from experienced innovators.

Working with Wollongong University, CSIRO has also been funded to deliver hyperspectral imaging technology under the Grand Challenge to counter improvised threats.

PFRA / Strategic partner	Priority technology areas	Number of projects	Defence investment
CSIRO Data61	Cyber Strategic Partnership	1	$16,300,000
CSIRO	Counter Improvised Threats, Multidisciplinary Material Sciences, Medical Countermeasures, Defence Research Accelerator	4	$3,228,000
DMTC	Medical Countermeasures Strategic Partnership	1	$7,536,000

Cooperative Research Centres

The NGTF has entered into strategic partnerships with a number of enterprises that facilitate research projects on Defence's behalf. These enterprises coordinate funding for research projects from multiple sources including Defence, industry and universities. Defence has agreements at the highest level with these enterprises but is not always a party to the project arrangements. The funding provided through the NGTF is leveraged significantly through this arrangement.

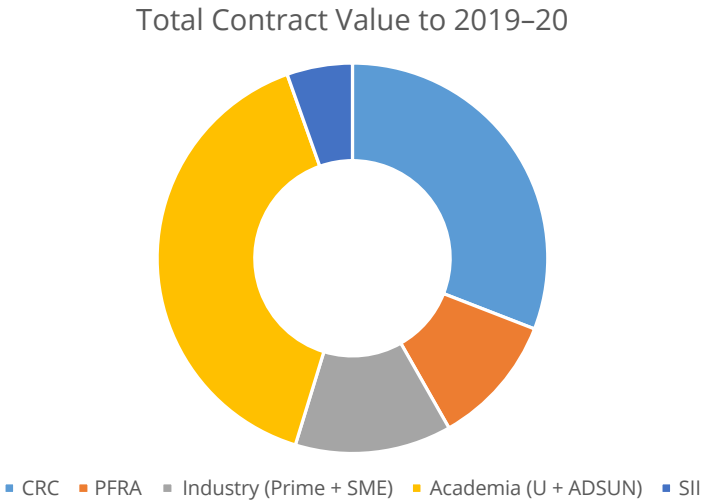
The list below contains the cumulative investment in the priority technology areas to date, excluding the investment in Data61, which is captured above.

CRC partner	Priority technology areas	Number of projects	Defence investment
TAS-DCRC	Trusted Autonomous Systems	1	$50,000,000
SmartSat CRC*	Space Capabilities	1	$3,550,000
Future Battery Industries CRC Ltd*	Multidisciplinary Material Sciences	1	$250,000

** New agreement in 2019–20*

FUNDING DISTRIBUTION BY ORGANISATION TYPE

At the conclusion of the reporting period, 13 per cent of all investments made since launch were with industry partners, 40 per cent with universities, 11 per cent with publicly funded research agencies and 36 per cent with CRCs or strategic partnerships and investments.



Funding distribution by organisation type to date

RESEARCH QUALITY ASSURANCE

The *2016 Defence Industry Policy Statement* clearly articulated how Defence's innovation initiatives, including the NGTF, would be established. The policy stated that Defence would systematically remove barriers to innovation by changing both its culture and its business processes.

In the case of the NGTF, DSTG was charged with delivering a program of high-quality research featuring collaborations across the full span of Australia's innovation enterprises and with Australia's allies. DSTG has delivered on that charge – the program is now fully operational with commitments as at 30 June 2020 of more than $174 million to support collaborative research. This includes research projects across every one of the inaugural priority areas identified in the *2016 Defence Industry Policy Statement*.

The NGTF has been designed with a future focus. This future focus will be further crystallised through addressing challenging S&T problems such as those stemming from the STaR Shots. The STaR Shots will ensure that the NGTF has a clear and measurable impact in terms of Defence's capability. While the STaR Shots represent one mechanism for Defence funding, funding of other S&T priorities identified by the NGTF will continue, as will opportunities for industry – specifically, small and medium enterprise – to engage in developing and maturing new technology.

Plans for 2020–21

DEFENCE S&T STRATEGY

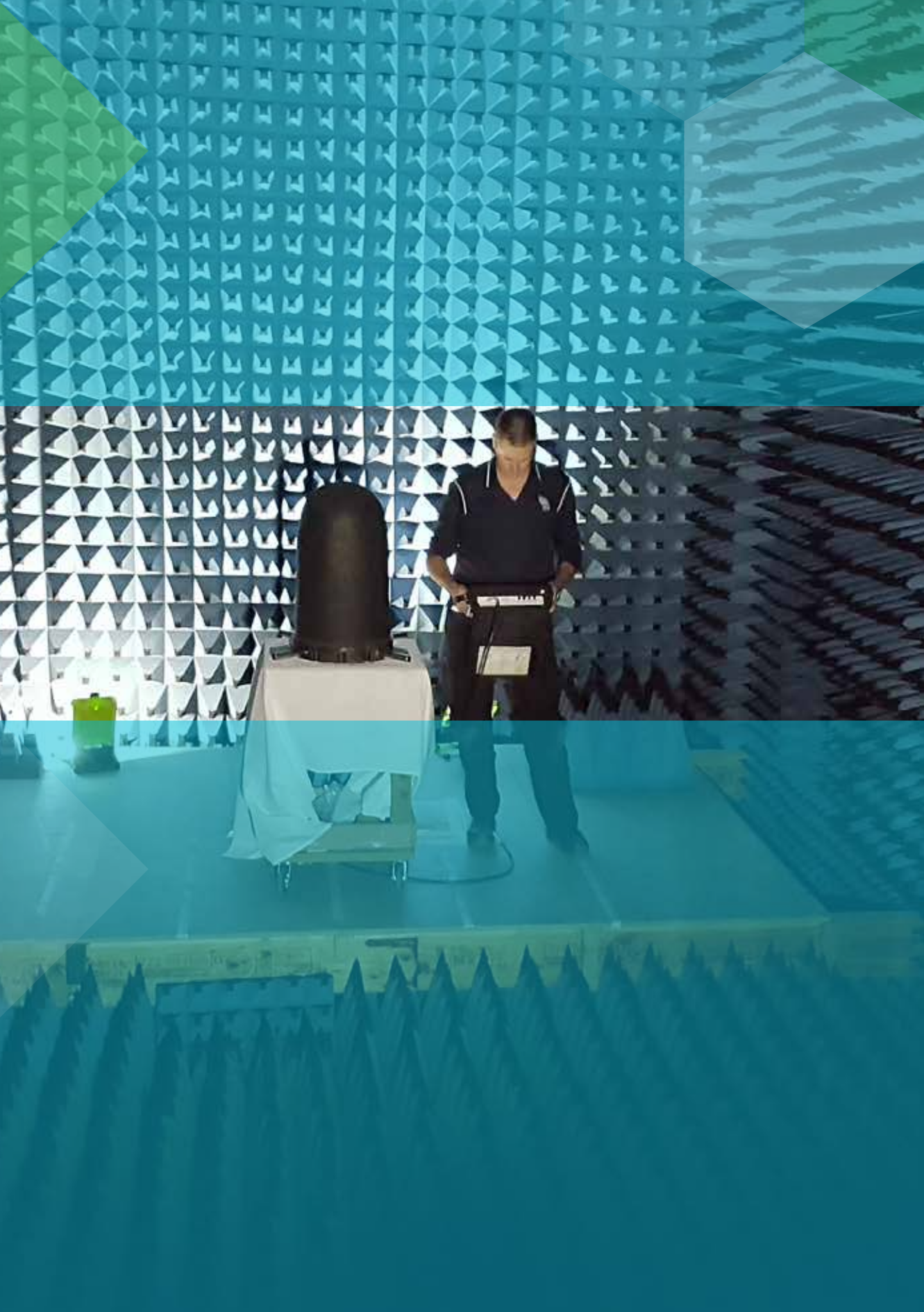
As part of the Defence S&T Strategy for Defence 2020–2030, the NGTF is investigating the prioritisation of investments towards mission-driven problems including the Science Technology and Research (STaR) programs, called STaR Shots.

TRANSITION TO IMPACT

In 2020–21, the Defence Innovation Hub and the NGTF will continue to strengthen to ability of the Defence innovation ecosystem to develop projects that support creation of truly innovative and leap-ahead technologies and concepts. Our aim is to ensure that the outputs of these projects transition to future Defence capability enhancements. Both programs are continuing to build the mechanisms and strengthen the metrics to enable us to track success.

CONTINUOUS IMPROVEMENT

In 2020–21, the NGTF will continue its continuous improvement program, including exploring ways to further streamline processes to provide more timely outcomes and to strengthen communication with industry and research organisations.



DEFENCE INNOVATION HUB

The Defence Innovation Hub enables collaboration on innovative technologies that can be developed into advanced capability for Defence

Program performance of the Defence Innovation Hub is reported over the following pages. Strategic measures are reported qualitatively, supported by quantitative performance information.

DEFENCE INNOVATION HUB

DEFENCE INNOVATION HUB IMPACT STATEMENT

The Defence Innovation Hub continues to enhance Defence capability through innovation and to deliver for the Australian defence industry and innovation sector. The Defence Innovation Hub partners with innovative Australian businesses of all sizes, research organisations and academia to develop cutting-edge defence capabilities and build Australian industry capability. Technologies being developed by the Defence Innovation Hub cover all of Defence's capability priority streams and span all phases of development, from concept exploration through to system integration.

Delivering Defence Capability

Between its launch in late 2016 and June 2020, the Defence Innovation Hub signed 148 contracts with Australian businesses and research institutions valued at over $240 million in innovative defence technologies. This included signing a record 52 contracts valued at over $105 million in 2019–20, a 32 per cent increase over the previous year. This investment in Australian innovation is driving the development of a wide range of cutting-edge and world-first technologies to enhance Defence's warfighting capabilities. Investments in 2019–20 included over $46 million in uninhabited and autonomous vehicle technology, around $10 million in space-related technology, and around $9 million in radar-related technology.

As the Defence Innovation Hub's portfolio continues to mature, its investment in technologies that are closer to delivering Defence capability increases. Technology developed through projects managed by the Defence Innovation Hub has begun transitioning to Defence acquisition programs. For instance, electronic warfare technology developed through a project managed by the Defence Innovation Hub has transitioned into the Modernisation of Maritime Electronic Warfare program. Numerous other Defence Innovation Hub technologies are now approaching the stage at which they could be considered for potential acquisition – including uninhabited surface vessels, small uninhabited aerial vehicles, body armour, mobile targets, ship-borne satellite antennas, and a joint terminal attack controller training capability. To see how the Defence Innovation Hub is progressing promising technologies towards higher stages of technical maturity and defence capability outcomes, see page 62.

COVID-19 Support

Throughout the second half of the financial year, the Defence Innovation Hub adapted to support partners in the Defence innovation sector during the COVID-19 pandemic. This included revising and extending project timelines, releasing progress payments and supporting virtual technology demonstrations for Defence stakeholders to allow projects to continue. This assistance helped businesses to remain resilient and active during this period.

Building Industry Capability

Defence Innovation Hub investment is growing Australian industry capability. Of the 95 Hub projects that were active in 2019–20, 93 per cent were expected to have a good, very good or exceptional impact on Australian industrial capability by developing defence-relevant skills and technologies that are in short supply. This includes 38 per cent that were expected to have an exceptional impact on Australian industry capability by developing world-leading skills and technologies.

By promoting industry collaboration and subcontracting between businesses and universities, the Defence Innovation Hub has ensured that positive economic benefits and local economic development have extended beyond large metropolitan areas to regional areas and to smaller states and territories such as Tasmania and the Northern Territory. Defence Innovation Hub projects active in 2019–20 supported more than 600 jobs across every Australian state and territory, enabling Hub partners to employ additional staff and bring on specialist skills.

The Defence Innovation Hub's small-business-friendly contracting and investment model helps small businesses from across Australia work directly with Defence. Over 80 per cent of Defence Innovation Hub investment has been with Australian small and medium businesses, and over 100 individual small and medium businesses have benefited from Defence Innovation Hub funding. By investing in innovative Australian small and medium businesses, the Defence Innovation Hub is helping to build a vibrant, diverse and globally competitive defence industry and innovation sector.

OVER 600 NEW JOBS SUPPORTED FROM DEFENCE INNOVATION HUB CONTRACTS

A key part of building Australia's defence industry and innovation sector is encouraging businesses to diversify into the sector. Around 24 per cent of Defence Innovation Hub partners are new to working with Defence. By contracting with the Defence Innovation Hub, these businesses gain valuable experience in working with Defence. One example is NSW start-up and small business Spiral Blue, which signed a $644,000 contract with the Defence Innovation Hub in June 2020, its first Defence contract. Spiral Blue is developing a cutting-edge satellite imagery processing system capable of monitoring large geographic areas. Through its contract with the Defence Innovation Hub, this start-up has been able to grow and significantly invest in additional staff, despite the impact of COVID-19.

> *'The Defence Innovation Hub has been amazing in their support and flexibility during COVID-19. We experienced schedule risks due to the combination of supply chain issues and the inability to travel, which reduced our ability to collaborate with partners and suppliers as planned due to the COVID restrictions in Melbourne. The Defence Innovation Hub supported us in risk planning and mitigation implementation so that we could provide certainty to all stakeholders, whilst maintaining the core innovation activities in a dynamic and complex environment.'*
>
> **AMANDA HOLT, CHIEF EXECUTIVE OFFICER, SYPAQ**

CASE STUDY

ECLIPS Logistics: Adapting through COVID-19

In September 2019, the Defence Innovation Hub awarded a $3.3 million contract to ECLIPS Logistics, a veteran-owned small business. Under the contract ECLIPS is developing its Digitalised Joint Modular Intermodal Logistics System, or D-JMILS, to digitise ADF logistics and provide a reliable in-transit visibility capability.

Building on the modular packaging solution previously developed by ECLIPS, D-JMILS uses intrinsically safe and secure near-field magnetic communications to count and monitor the condition of assets throughout a global supply chain. This means that assets stored in remote locations can be accounted for at the push of a button from anywhere around the globe. The asset tags used are unaffected by line-of-sight obstructions and can be read through metal and inside shipping containers. If successful, the technology will be revolutionary for ADF logistics capability and allow mission kits and ready stores to be packaged, shipped, monitored and counted across the global Defence supply chain more efficiently than ever before.

While the project was impacted by supply chain delays caused by COVID-19, continued engagement between ECLIPS Logistics, the Defence Innovation Hub and Army Headquarters minimised the impact on schedule and allowed the project to remain within budget. This was achieved through consultation with Defence stakeholders and the implementation of ECLIPS's business continuity plans to use alternative preselected fabricators and manufacturers of critical components. The project is now on track for a successful technology demonstration.

> *'Due to COVID-19 and the inability to travel, our processes slowed down and we needed to change manufacturers at far greater cost and lead time. The Defence Innovation Hub supported our continuity plans which helped minimise the impact of COVID-19 and keep the project on track. ECLIPS appreciates the pragmatic and flexible approach by the Defence Innovation Hub in dealing with COVID.'*
>
> **MATT HANLON, DIRECTOR PRODUCTS, ECLIPS LOGISTICS**

Enhancing Defence capability through innovation

STRATEGIC APPROACH TO INVESTMENT

In 2019–20, the Defence Innovation Hub investment portfolio comprised six capability streams aligned with Defence capability priorities.

The top three priorities for 2019–20 were:

1. Intelligence, Surveillance, Reconnaissance, Electronic Warfare (ISREW), Space and Cyber
2. Key Enablers
3. Land Combat, Amphibious Warfare and Special Operations.

The response to these priorities from industry has been strong, with over 85 per cent of contracts awarded under the Defence Innovation Hub's open call for submissions aligned with Defence's top three capability priorities.

The total investment by the Defence Innovation Hub through its open call for submissions since launch in 2016 for each of the six capability priority streams is outlined below.

Innovation domain	Summary of investment	Total investment
Intelligence, Surveillance, Reconnaissance, Electronic Warfare, Space and Cyber	50 contracts for innovations including artificial intelligence, space, mapping and GPS, radar, and encryption technologies	$93,157,000
Key Enablers	17 contracts for innovations including training and simulation platforms, software platforms and laser technologies	$22,003,000
Land Combat, Amphibious Warfare and Special Operations	33 contracts for innovations including body armour, drones, weapons systems and networking equipment	$50,240,000
Maritime and Anti-Submarine Warfare	14 contracts for innovations including super cavitation technology, satellite communications systems and uninhabited autonomous surface vehicles	$36,379,000
Strike and Air Combat	2 contracts for innovations including air combat training solutions, and sea skimming missiles	$6,275,000
Air and Sea Lift	2 contracts for innovations including lightweight armour and carbon fibre technologies	$3,053,000

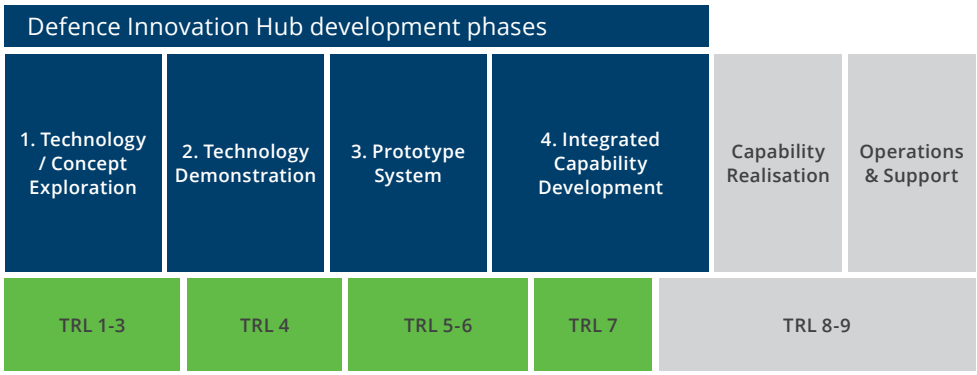
MATURING TECHNOLOGY TOWARDS CAPABILITY

To develop innovative technology towards enhanced Defence capability, the Defence Innovation Hub uses a phased approach that allows technology to be developed and matured in collaboration with Defence's capability managers.

The program invests across four stages of maturity: Phase 1 – Concept Exploration; Phase 2 – Technology Demonstration; Phase 3 – Prototyping; and Phase 4 – Integrated Capability Development. The Defence Innovation Hub is bringing individual projects within each of these phases towards higher levels of technology readiness and transitioning some projects that have successfully completed one phase on to the next. Eight projects valued at $30 million were transitioned to a follow-on phase of development in 2019–20. The Defence Innovation Hub is also increasingly investing in projects at higher maturity phases of development.

Most Defence Innovation Hub projects cover the middle stages of technology development, from Technology Readiness Level[2] (TRL) 3 to TRL 5 – with the number of technologies reaching a more mature state increasing over time. The tables below show the alignment of the Hub's four investment phases with the TRL scale and provide a description of each TRL.

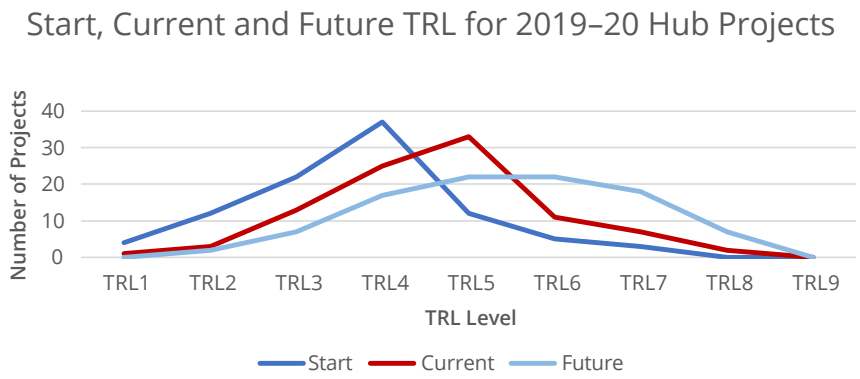
[2] The Technology Readiness Level (TRL) index is a globally accepted benchmarking tool for measuring the maturity of technology.



Technology Readiness Levels

Level	Maturity level	Description
1	Basic principles observed and reported	Lowest level of technology readiness. Research begins to be translated into applied R&D.
2	Technology concept/application formulated	Invention begins. Applications might be speculative and there may be no proof yet of detailed assumptions.
3	Analytical/ experimental proof of concept	Active R&D begins. This includes analytical studies to validate the predictions and assumptions.
4	Component validation in a laboratory	Basic technical components are integrated to establish that they will work together.
5	Component validation in the environment	Basic technology components are integrated with reasonably realistic supporting elements to be tested.
6	System model or prototype demonstration	Model or prototype system is tested. Major step up in technology's demonstrated readiness.
7	System model or prototype demonstration in operational context	Prototype or near planned operational system. Requires demonstration of an actual system in operational context.
8	System complete and qualified through test and demonstration	Technology has been proven to work in its final form and under expected conditions.
9	System proven through successful mission operations	Technology is in its final form and operated under the full range of operating mission conditions.

The chart below shows the TRL start points for Hub projects that were active during 2019–20 (dark blue line, with the largest proportion of projects at TRL 4), their current development status (red line, with a peak of TRL 5), and the planned future development status of these projects under existing contracts (light blue line, with an increasing number of projects reaching TRL 6 to TRL 8). As the technologies being developed by the Defence Innovation Hub mature, more of them are reaching technology readiness levels at which they may become potential candidates for acquisition.



CASE STUDY

GPSat – GPS jamming and spoofing rapid threat geo-location

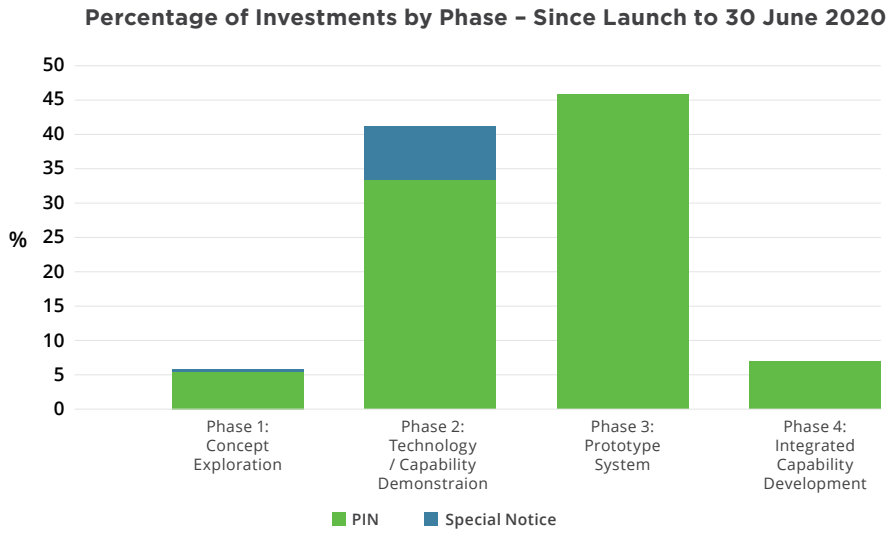
In November 2018, the Defence Innovation Hub signed a Phase 3 – Prototype System contract with Victoria-based small business GPSat Systems worth over $1.1 million to evolve GPS jamming and spoofing (J&S) counter measures from TRL 6 to TRL 7.

GPS is a highly effective global navigation utility, but its vulnerability to jamming is a major concern. Malicious or accidental jamming and spoofing activities have the potential to severely cripple or interrupt mission-critical GPS safety operations. This includes military forward combat engagement zones and general civil essential support logistical activities such as airports, telecommunication networks and logistic transport services.

Existing technologies in the communications industry to address J&S use 'broad-brush' equipment that cannot effectively detect and geo-locate very weak signals over long distances. Through its contract with the Defence Innovation Hub, GPSat Systems is turning entry-level academic research into market-ready equipment that can address these threats. GPSat Systems has a longstanding relationship with The University of New South Wales and The University of Adelaide, through which the foundational technology and theoretical research behind weak signal processing and advancing complex antenna array theory was developed. Under its contract with the Defence Innovation Hub, GPSat Systems is now working with elite Australian electronics fabricators to turn its unique technology into rugged field-ready and in-production equipment for both the domestic and international markets.

The Defence Innovation Hub contract has de-risked the substantial manufacturing expenses associated with highly complex electronics maturation and has allowed GPSat Systems to hire additional employees and specialist contractors. GPSat Systems has also successfully worked together with the Defence Innovation Hub to mitigate the impact of COVID-19 on the project, including using a live stream demonstration from rural central Victoria to a large Defence audience across Australia.

The graph below shows the investment in each of the four phases of maturity since the launch of the Defence Innovation Hub in 2016. Since launch, the Defence Innovation Hub has signed 41 contracts worth $122 million at the two highest phases of technology maturity (Phase 3 - Prototyping and Phase 4 - Integrated Capability Development).



Note: The graph includes investments under the Defence Innovation Hub's open call for submissions, the Priority Innovation Notice, and targeted Special Notices. For more information on the Priority Innovation Notice and Special Notices see pages 77 and 78.

The Defence Innovation Hub is also transitioning successful innovation projects to follow-on phases of development where there is support from Defence stakeholders for further development of the technology once a project is complete. Through its phase transition process, the Defence Innovation Hub can ask an innovation partner to submit a proposal for a further phase of development via a limited tender process.

CASE STUDY

AMSL Aero – Autonomous Aircraft

One of the projects to transition to a more advanced phase in 2019–20 was AMSL Aero's autonomous electric vertical take-off and landing aircraft. In November 2019, the Defence Innovation Hub awarded the Sydney-based small business its second innovation contract, worth over $3.2 million, by way of a phase transition. AMSL Aero is developing the most efficient vertical take-off and landing aircraft in development anywhere in the world. If successful, the project will provide a high-speed, runway-independent, autonomous aircraft. This would enable rapid retrieval of wounded soldiers from dangerous situations without the risk of losing an expensive helicopter and its crew, as well as enabling a new approach to logistics whereby cargo can be delivered within minutes of request, anywhere within a battlespace.

As a result of its first contract with the Defence Innovation Hub, AMSL Aero reported that it was able to grow from two to ten employees. With its second innovation contract, the company now directly employees 16 people, with an additional ten employees through subcontractors. The company has also been able to successfully leverage its contracts with the Defence Innovation Hub to attract additional commercial customers and significant public and private external investment.

> *'The Defence Innovation Hub has provided a great mechanism for allowing our company to showcase how we can solve complex problems for the Defence customer. It has allowed us to grow our team, attract substantial public and private investment and gain global visibility for our technology.'*
>
> **ANDREW MOORE, CHIEF EXECUTIVE OFFICER, AMSL AERO**

INVESTING IN CUTTING-EDGE TECHNOLOGY

In 2019–20, the Defence Innovation Hub continued to invest significantly in cutting-edge and world-first technology with transformative capability potential, including the following.

- Over $46 million in uninhabited and autonomous vehicle technology, including a contract with Defendtex Research Labs worth over $2.1 million for its Hydra – Multi Domain UxV for Anti-Submarine and Anti-Surface Warfare technology signed in June 2020. If successful, this project has the potential to improve the safety of ADF personnel deployed on operations through an enhanced drone platform that can be used across a range of operating environments.
- Around $10 million in space-related technology, including a $3.1 million contract awarded to DEWC Systems in January 2020 to use spacecraft that can facilitate improved situational awareness in the space domain.
- Around $5 million in artificial intelligence, including a $1 million contract signed in February 2020 with Melbourne-based Agent Oriented Software for a project to enhance the resilience of mobile field communications using AI and autonomous uninhabited ground vehicles.
- Around $10 million in cyber technology, including a $1.6 million contract signed with Canberra-based QuintessenceLabs in February 2020 to develop a system that can rationalise multiple information systems into a single online environment.
- Around $9 million in radar technology, including a $3.2 million contract awarded to Sydney-based small business Jenkins Engineering Defence Systems (JEDS) in January 2020. Under the contract, JEDS is developing a cost-effective maritime radar electronic support system that can provide automated warnings and recording capability for potential threat signals without the need for a dedicated expert operator.

CASE STUDY

Textron Systems Australia – Huntsman® Small Uninhabited Aircraft System

Textron Systems Australia is developing a cutting-edge Small Uninhabited Aircraft System (SUAS) called Huntsman® for use by Australian soldiers.

After the successful completion of its $282,000 Phase 1 contract with the Defence Innovation Hub, the project successfully moved through the Defence Innovation Hub's phase transition process. In November 2019, Textron was awarded a $3.4 million Phase 2: Technology and Capability Demonstration contract to develop a proof-of-concept system and to demonstrate high-level system capabilities. Textron has now flown an early iteration of its SUAS and has tested a wide array of developmental subsystems, which will be iteratively integrated over the coming months.

The SUAS can undertake and acquire real-time electro-optical/infrared intelligence, surveillance and reconnaissance (ISR). This is augmented by a high level of automation, minimising operator interaction with the system and allowing simplified operator training. With extended range, portable and backpackable size, and vertical-take-off-and-landing capabilities, the Huntsman system has increased versatility and endurance for a wide range of mission sets.

If successful, the Huntsman system will provide Defence with higher fidelity ISR information in a smaller footprint and loadout than existing technology. Successful development of the Huntsman system through the Defence Innovation Hub would also provide Textron with numerous opportunities beyond Defence, including export opportunities for both commercial and international defence organisations.

Growing the capability and capacity of the Australian industry and innovation sector

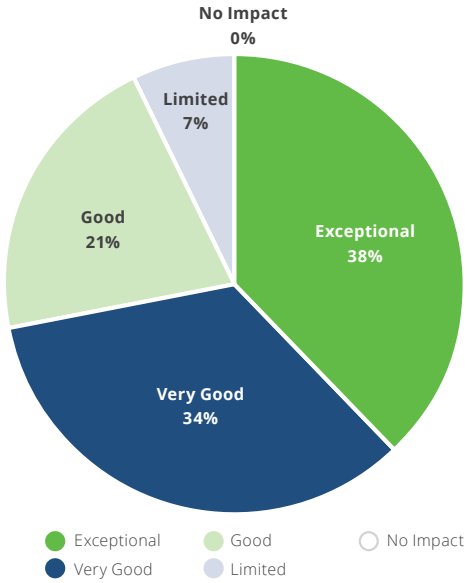
The Defence Innovation Hub welcomes submissions from all types of businesses and research organisations and is committed to building a vibrant and globally competitive Australian industry and innovation sector.

Defence Innovation Hub investments are building Australian skills and technology and enhancing the capability of the Australian defence industry. In 2019-20, 93 per cent of active Defence Innovation Hub projects were expected to develop defence-relevant skills and technologies that are in short supply in Australia, with 38 per cent of projects expected to develop world-leading defence-relevant skills and technologies. By building a world-leading skill-base in Australia and generating significant jobs growth, the Defence Innovation Hub is ensuring that Australia has a defence industry workforce that is capable of developing the cutting-edge technologies that the ADF needs to maintain its capability edge.

Hub partners report that Defence Innovation Hub contracts have provided them with a range of benefits, including:

- the opportunity to closely engage with, and be guided by, Defence capability managers
- support from Defence Innovation Hub project managers
- increased understanding of Defence's capability requirements and how to work with Defence
- increased credibility and confidence to help attract interest from outside investors and other customers.

Contribution to Australian Defence Industry Capability of Projects Active in 2019–20



- **Exceptional:** development of defence-relevant skills and technologies in Australia that are world-leading, and/or priority sovereign skills ahead of those currently available in Australia
- **Very good:** development of defence-relevant skills and technologies in Australia ahead of those currently available in Australia, and/or priority sovereign skills in short supply in Australia
- **Good:** development of defence-relevant skills and technologies in Australia that are already available in Australia but in short supply
- **Limited:** development of defence-relevant skills and technologies in Australia that are already widely available in Australia

> *'Our contract with the Defence Innovation Hub has enabled us to establish a new area of growth for our business with significant commercial potential within the ADF and via export markets. This contract has enabled us to develop our own local supply chains, provided our company with opportunities to join global supply chains, exposed us to new areas of Defence and has seen us deepen our relationships with Defence Science and Technology and academia.'*
>
> **BEN NORRIS, CHIEF EXECUTIVE OFFICER, DARONMONT TECHNOLOGIES**

SUPPORTING SMALL BUSINESS

The Defence Innovation Hub recognises that some of the best ideas can come from small and medium-sized organisations. By providing equal opportunity for smaller businesses to put forward their great ideas and to collaborate in developing innovative technologies, the Defence Innovation Hub ensures that the talent and skills of Australian industry and research organisations are fully utilised.

The Defence Innovation Hub invested a record amount in Australian small and medium businesses in 2019–20, with small and medium businesses leading 45 out of 52 contracts signed during the year, worth over $92 million. Since launch, more than 80 per cent of Defence Innovation Hub investments have been with small and medium businesses and more than 100 Australian small and medium businesses have benefited from Hub funding, allowing them to grow their businesses, attract new investment and customers, and employ new staff. By supporting small and medium businesses, the Defence Innovation Hub is helping to build a resilient and diverse Australian defence industry base.

For example, Sydney-based small business Mission Systems signed two Defence Innovation Hub contracts in 2019–20. Under these contracts Mission Systems is developing mine neutralisation technologies that seek to enhance the safety of ADF personnel in the maritime domain. These contracts have enabled Mission Systems to invest in infrastructure and recruit nine additional staff members, including highly skilled engineers and programmers.

> *'As a young small business, the Defence Innovation Hub has allowed us to grow and mature by investing in additional staff and infrastructure. Through our contract, we have engaged specialist engineers and subject-matter experts and directed resources to exploring additional product ideas.'*
>
> **DAVID BATTLE, CO-FOUNDER, MISSION SYSTEMS**

CASE STUDY

Sentient Vision Systems – Autonomous wide area motion imagery system over land (vIDAR)

In October 2018, Victoria-based small business Sentient Vision Systems was awarded a $5.5 million innovation contract to design and develop a prototype that extends the capability of its ViDAR (Visual Detection and Ranging) maritime optical radar technology to the land domain.

ViDAR is a wide-area motion imagery system that autonomously detects, tracks and classifies moving objects over wide areas of terrain below an aircraft using state-of-the-art computer vision and AI algorithms. Designed as a payload for manned and uninhabited aerial platforms, the system combines reconnaissance and surveillance capabilities with autonomous AI to provide persistent and real-time pattern-of-life depiction over a wide area, removing clutter and allowing the user to focus on situational awareness and detections of interest. The system can operate in remote, rural or urban environments and provides day, night and low-light operational capability in a multitude of environmental condition.

Sentient Vision's contract with the Defence Innovation Hub has generated opportunities to collaborate with other Australian small and medium businesses in related fields. It has also allowed the company to hire four additional employees and grow its skill-base in computer vision, deep learning and integration of embedded sensor systems on aerial platforms. By working with the Defence Innovation Hub, Sentient Vision Systems' engagement with key Defence stakeholders and understanding of defence capability needs has increased dramatically.

PERCENTAGE OF INVESTMENT BY ENTITY TYPE

Entity type	2019–20
Micro business (1 to 4 employees)	20%
Small and medium business (5 to 199 employees)	68%
Large business (200 or more employees)	4%
Educational / Research institution	8%
Total	**100%**

NEW ENTRANTS TO THE SECTOR

24 PER CENT NEW TO DOING BUSINESS WITH DEFENCE

Since the Defence Innovation Hub was launched in 2016, 24 per cent of partners entering into contract with the Defence Innovation Hub have been new to doing business with Defence. In 2019–20, the Defence Innovation Hub signed contracts with eight businesses that had not previously done business with Defence.

An example is Glia Diagnostics, a Sydney-based company which works in collaboration with medical and scientific experts worldwide to assist in the validation of biomarkers to definitively diagnose traumatic brain injuries. In December 2019, the Defence Innovation Hub signed a contract worth $1.1 million to develop a medical test and sample collection device that can be used to diagnose traumatic brain injury and concussion.

Undiagnosed traumatic brain injury can cost the military thousands of hours and potentially millions of dollars in ongoing care. If the project is successful, Defence will have access to a novel, robust technology that can potentially be easily translated into military-aligned local manufacturing and diagnostic facilities. This innovation could improve the diagnosis, triage and treatment outcomes for Defence personnel who may be impacted by traumatic brain injury.

COLLABORATION BETWEEN INDUSTRY AND RESEARCH ORGANISATIONS

By encouraging the development of collaborative partnerships between industry and academia, the Defence Innovation Hub is helping Australian business harness the research power of Australia's world-class research organisations.

For example, RUAG Australia was awarded a contract worth over $272,000 in February 2020 to explore a new additive technology for repairing metal components and structures such as mechanical systems, hulls and armour. RMIT University has worked with RUAG to provide specialist technology advice and metallurgical analysis for the project. If successful, this technology could offer significant sustainability benefits by reducing costs and improving operational agility.

While most Defence Innovation Hub partners are businesses, 88 personnel from 22 universities and research institutions were involved in 37 Defence Innovation Hub projects in 2019–20, representing 39 per cent of active projects. Seven Defence Innovation Hub projects active in 2019–20 were led by universities and research institutions.

University	Contract overview	Contract value
The University of Adelaide	Develop an active exhaust silencer for diesel engines to reduce engine cylinder firing frequency noise and harmonics.	$2,431,000
The University of Sydney	Continue development of a new imaging system that uses light technology to enhance real-time situational awareness.	$6,551,000
Western Sydney University	Design an optical imager for space surveillance based on recently developed dynamic range asynchronous array imaging technologies.	$5,456,000
Deakin University	Develop a pilot training system concept for the Royal Australian Air Force. The development of Australia's first high g-force training simulator will offer the Air Force access to world-class training locally.	$263,000
The University of Newcastle	Explore development of enhanced resilience training for ADF personnel through a set of virtual reality-based training sessions involving controlled exposure to adverse environments.	$2,145,000
University of Technology Sydney (UTS)	Develop physiological sensors that can be used to facilitate brain–robot Interaction.	$1,342,000
Macquarie University	Undertake initial research into indigenous laser technology.	$263,000

The Defence Innovation Hub also supports collaboration in the defence industry through its services contract with DMTC. DMTC works collaboratively with innovative Australian industry, research and government partners to deliver enhanced defence and national security capabilities and strengthen Australian industrial capacity. In June 2020, the Defence Innovation Hub signed a $4 million contract extension with DMTC. This includes $1.65 million for research and development and innovation activities, and $1.1 million to support DMTC's supply chain development activities, many of which are in regional and remote areas of Australia.

> *'The Defence Innovation Hub plays a vital part in shaping the future force through fostering collaboration between industry, government and academia.'*
>
> **AIRCDRE RICHARD LENNON, DIRECTOR GENERAL, FORCE EXPLORATION**

CASE STUDY

University of Technology Sydney – Robots controlled by brainwaves

In January 2020, the Defence Innovation Hub signed a contract worth over $1.2 million with the University of Technology Sydney (UTS) for a two-year Phase 2: Technology and Capability Demonstration contract. Through this project, researchers are collaborating to examine how brainwaves can be used to command and control autonomous vehicles. If successful, the project will expand human–robot interaction through the integration of electrical brain signals from miniature physiological sensors with a brain signal decoder.

The project combines the joint expertise of Professor Francesca Iacopi, a global expert in nanotechnology, and Distinguished Professor CT Lin, Director, UTS Computational Intelligence and Brain Computer Interface Lab. Professor Iacopi specialises in the translation of basic advances in materials into scalable semiconductor technologies and has produced a series of world-leading innovations using graphene. Professor Lin's expertise is in the brain and behaviours, the physiological changes that occur when human cognitive functions are working, and ways to combine human physiological information with AI to develop monitoring and feedback systems. He has extensive experience in wearable and wireless devices, measuring brain waves (electroencephalogram, or EEG, signals) and mitigating the 'noise' that can affect brain–computer interface performance.

The Defence Innovation Hub is combining these two researchers' respective expertise in cognition neuroscience and device engineering to develop wearable technology. If successful, the final product will be miniaturised, customised, graphene-based sensors and brain-wave decoders that are smaller, more ergonomic and more biocompatible than off-the-shelf models. This will improve the flow of information from humans to robots, so that humans can make better-informed decisions and respond to complex, stressful situations. The project may also have significant application outside of Defence, including for medical technology and biotechnology.

DEFENCE INNOVATION HUB INVESTMENTS BY STATES AND TERRITORIES

The Defence Innovation Hub is delivering economic benefits to every state and territory in Australia.

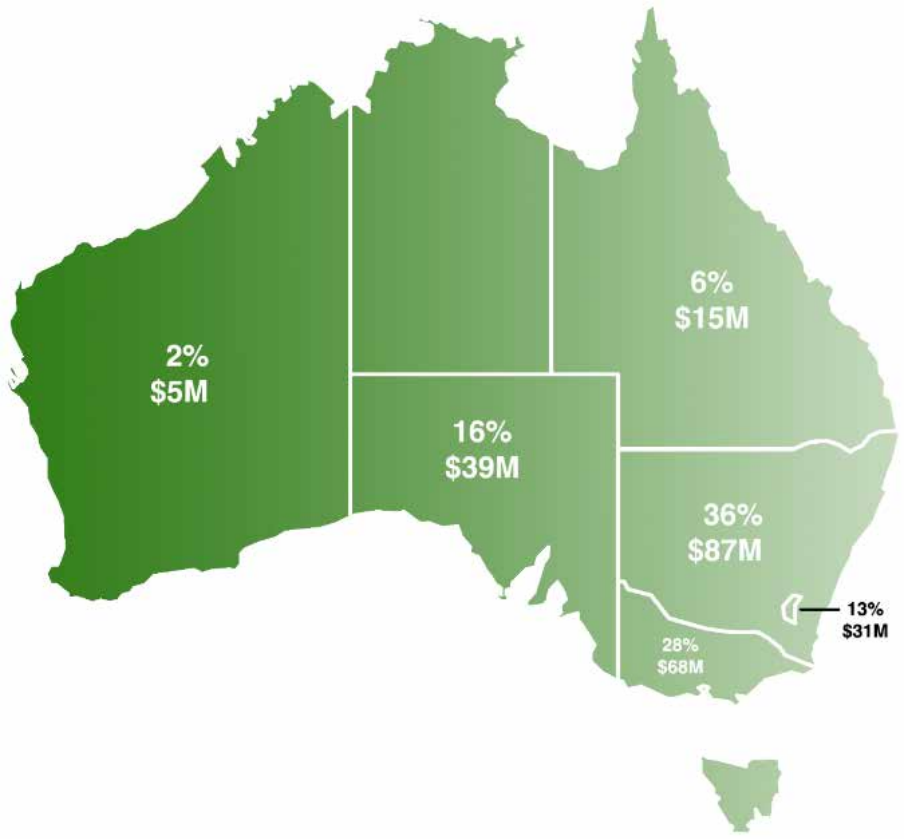
Since the launch of the Defence Innovation Hub in December 2016, the majority of investment has been with businesses and research organisations based in New South Wales, Victoria, South Australia, Queensland and the ACT. The higher investment rate in these locations corresponds with the high number of proposals coming from those areas. For instance, in 2019–20, 25 per cent of all proposals across the Defence Innovation Hub's program were received from New South Wales.

Defence Innovation Hub investment is also benefiting other states and territories. In 2019–20, the Defence Innovation Hub signed a $1.8 million contract with Western Australia-based company AVI to develop an innovative solution to combine data from multiple systems across a range of networks. AVI is a leading Western Australian technology company that designs and manufactures critical communications systems using hardened electronic hardware and agile technology solutions. If successful, this innovation will assist tactical and operational commanders in command and control of their forces by improving their situational awareness and, decision-making and by aiding the dissemination of information across dismounted and vehicle-mounted units.

Defence Innovation Hub investment is not restricted to the major cities. Since 2016, the Defence Innovation Hub has invested more than $18.1 million in businesses based in regional Australia. This includes the Defence Innovation Hub's second-largest contract, worth over $7 million, signed with the Hunter Valley's BlueZone Group in May 2020. BlueZone Group companies are focused on the application of world-leading technology to enable operations, science, maintenance and repair to be conducted in underwater or water-based environments. Under its contract with the Defence Innovation Hub, BlueZone Group is developing a sophisticated uninhabited surface vehicle that could be integrated into Australia's future frigates. The platform can accommodate a range of payloads that could broaden the capabilities of Royal Australian Navy ships by extending their situational awareness while deployed on operations.

Although smaller states and territories such as Tasmania and the Northern Territory accounted for less than two per cent of proposals received, Defence Innovation Hub projects have benefited both Tasmania and the Northern Territory through subcontracting arrangements. For example, one Tasmanian subcontractor, Currawong Engineering, has been engaged in six Defence Innovation Hub projects. Currawong is a specialist manufacturer of powertrain systems for unmanned aerial vehicles and its work on Defence Innovation Hub projects has supported Tasmanian jobs.

The map below indicates the location and value of Defence Innovation Hub investment, based on the business address of the lead contractor, from the launch of the program in December 2016 to 30 June 2020. The map does not identify subcontractor locations.



GLOBAL SUPPLY CHAIN

The success of the Global Supply Chain Program, managed by the Centre for Defence Industry Capability, is benefiting Defence Innovation Hub partners. Twelve industry partners[3] reported that they were part of a global supply chain in 2019–20.[4]

[3] *A Defence Innovation Hub industry partner is an entity that has been under contract with the Defence Innovation Hub, excluding research organisations.*

[4] *Source: Data collected from Defence Innovation Hub partner questionnaires 2018–20. The response rate for the 2020 questionnaire was 58 per cent.*

Investment portfolio – Priority Innovation Notice

Through the innovation portal, the Defence Innovation Hub accepts proposals to its open call for submissions (the Priority Innovation Notice) 365 days a year. The Defence Innovation Hub seeks proposals aligned with the Defence Innovation Hub's investment capability priorities. The six capability streams that made up the investment capability priorities remained unchanged in 2019–20. More detailed information on Defence's investment priorities is available from the Defence Innovation Portal (www.innovationhub.defence.gov.au).

PROPOSALS SUBMITTED BY CAPABILITY STREAM

In 2019–20, the Defence Innovation Hub received a total of 142 proposals across its six innovation priorities.

Innovation Priority	Percentage of proposals received
Intelligence, Surveillance, Reconnaissance, Electronic Warfare, Space and Cyber	29.6%
Key Enablers	22.5%
Land Combat & Amphibious Warfare and Special Operations	28.9%
Maritime & Anti-Submarine Warfare	10.6%
Strike & Air Combat	4.2%
Air & Sea Lift	4.2%

INVESTMENTS BY CAPABILITY STREAM

In 2019–20, 142 proposals were submitted to the Defence Innovation Hub and 60 respondents were invited to proceed to the second stage of assessment by submitting a more detailed proposal. Detailed proposals were reviewed by the Defence Innovation Hub's technical assessors, capability managers and investment advisory group, and 37 contracts were awarded.

Innovation Priority	No. of contracts	Total value
Intelligence, Surveillance, Reconnaissance, Electronic Warfare, Space and Cyber	14	$32,445,000
Key Enablers	6	$11,316,000
Land Combat & Amphibious Warfare and Special Operations	10	$21,267,000
Maritime & Anti-Submarine Warfare	7	$20,558,000
Strike & Air Combat	—	—
Air & Sea Lift	—	—

Investment portfolio – Special Notice

Special Notices are novel, challenge-based solicitations that seek innovative solutions from industry and research organisations to meet specific Defence capability challenges. Industry has responded strongly to these challenges, with over 300 Special Notice proposals received in response to eight Special Notices since the launch of the Defence Innovation Hub. Since the Defence Innovation Hub first supported Army Innovation Day in 2017, Special Notices run by the Defence Innovation Hub have resulted in over $24.5 million in contracts.

In 2019–20, the Defence Innovation Hub finalised three Special Notice procurements and awarded nine contracts totalling over $15 million to Special Notice respondents in the Land Combat, Amphibious Warfare and Special Operations capability stream.

ARMY INNOVATION DAY 2019 AND 2020

In 2019–20, the Defence Innovation Hub supported Army Innovation Day 2019 and Army Innovation Day 2020.

On 25 September 2019, the Defence Innovation Hub collaborated with Army for the sixth Army Innovation Day. The focus for 2019 was Network Assurance, with the Special Notice seeking innovative proposals that could increase network resilience and redundancy, defend the network through reducing an adversary's ability to deny, disrupt or exploit our information, and/or deceive an adversary as to the nature, disposition and characteristics of land networks and associated force elements. Australian businesses submitted 66 proposals, with 12 businesses selected to present their cutting-edge technologies to Army at the Australian Defence Force Academy.

In January 2020, the Defence Innovation Hub released the challenge statement for Army Innovation Day 2020 with the theme of Enhanced Land Force Support Systems. A total of 47 proposals were received from industry and 14 were invited to present at the seventh Army Innovation Day on 3 July 2020, using a virtual format due to COVID-19 restrictions.

> *'The collaboration between Army and the Defence Innovation Hub provides an opportunity for industry to pitch innovations that could shape Army's approach to meeting the challenges of a changing operating environment.'*
>
> **LIEUTENANT GENERAL RICK BURR AO, DSC, MVO, CHIEF OF ARMY**

Rapid Assessments

Rapid Assessments are a service offered by the Defence Innovation Hub targeting the needs of Defence capability managers. Rapid Assessments allow Defence to quickly scan the market for answers to capability problems.

Rapid Assessments are a collaboration between industry, academia and research to collaboratively analyse and answer questions relating to a Defence capability gap, opportunity or need, conduct market scans, and undertake risk reduction activities. The end product is a report that can be used to understand what capability and capacity Australian industry has in a particular area, to inform procurement planning and decisions down the track.

Through Rapid Assessments, Defence has been able to investigate a range of topics that will benefit Defence capability, including future satellite communications, communications security capabilities and systems to monitor the internal condition of a ship's fuel tanks.

Five Rapid Assessments, valued at approximately $559,000, were undertaken in 2019–20.

Continuous improvement

The Defence Innovation Hub's continuous improvement program continued to focus on simplifying, improving and streamlining processes and systems, and improving communication with industry. This included adapting procedures, tools and templates to simplify and streamline processes, earlier identification and mitigation of proposal risks, and improvements to the Defence Innovation Hub's ICT system (the Innovation Hub Management System).

Through the Defence Innovation Hub's continuous improvement program, assessment timeframes have continued to decrease, with the average timeframe for the end-to-end assessment process contracting between 2018 and 2019. The full assessment and contracting process can take from six months through to more than 12 months, depending on the quality and complexity of the proposal, the level of risk involved and the level of Defence support required. In 2020–21, the Defence Innovation Hub will continue to implement its continuous improvement program with a focus on further streamlining processes where possible without significantly increasing risk.

In April 2020, as part of its continuous improvement program, the Defence Innovation Hub sought feedback from internal and external stakeholders on their experiences with the Defence Innovation Hub and potential areas of improvement. The Defence Innovation Hub has developed a communications strategy that takes account of this feedback. This strategy includes a focus on improving engagement with industry to further strengthen relationships and increase understanding of the Defence Innovation Hub's processes.

BENEFITS MANAGEMENT FRAMEWORK

In 2019–20, the Defence Innovation Hub and NGTF continued developing a new common framework for measuring benefits and reporting on progress across

the two programs. This work has already shown that the Defence Innovation Hub is providing significantly greater economic benefits than previously identified and has provided insights into the progress that Hub projects are making towards capability.

OUTREACH TO INDUSTRY

The Defence Innovation Hub's premier public engagement event is its annual conference, which has attracted over 1,000 participants from industry and Defence over the last three years. Other notable events featuring Hub involvement in 2019–20 included the 2019 Pacific International Maritime Exposition conference, the Military Communications and Information Systems (MilCIS) Conference, and the DMTC Conference.

Plans for 2020–21

SUPPORT THROUGH COVID-19

The Defence Innovation Hub will remain fully operational throughout 2020–21 and will continue to invest in innovative Australian businesses to support economic recovery from the COVID-19 crisis. The Defence Innovation Hub will continue to work flexibly with its partners to manage challenges and support industry during this time.

GUIDANCE AND ENGAGEMENT WITH INDUSTRY

To help improve understanding of its procurement process and to encourage innovation that aligns with capability needs, the Defence Innovation Hub will publish a short guide for industry explaining the Hub's application process, innovation priorities, assessment criteria and timeframes. In addition, the Hub is planning a virtual 2020 Defence Innovation Hub conference that will enable Australia-wide industry participation. The Hub is also working with the CDIC and Defence capability stakeholders on webinars for industry on Defence contracting processes to help build understanding and capability in this area.

REVIEW OF INNOVATION PRIORITIES

The Defence Innovation Hub is in the process of reviewing its innovation priorities to ensure they remain aligned with the 2020 Defence Strategic Update and 2020 Force Structure Plan.

Defence Innovation Hub table of investments 2019–20

The Defence Innovation Hub awarded 52 innovation contracts during the year, with values ranging from $73,000 to more than $7 million, within a total investment of more than $105 million. Since its establishment, the Hub has also managed a portfolio of legacy innovation projects from previous innovation programs. As of 30 June 2020, one active legacy innovation project worth around $2.7 million remained active.

The following table details the innovation contracts entered into during the reporting period.

Company	Contract overview	Contract value
	ACT Total	**$12,976,000**
DXC Technology Australia Pty Ltd	Australian industry communication security capability.	$167,000
Eclips Logistics Pty Ltd	Digitise ADF logistics through the integration of Army's logistics information system with magnetic location tags and prognostic sensors on packaging solutions.	$3,272,000
Penten Pty Ltd	Continue development of its data protection products.	$5,435,000
Nova Defence Pty Ltd	Future Australian Defence Satellite Communication System (Future SATCOM).	$95,000
Quintessence Labs Pty Ltd	Develop a system that can rationalise multiple IT systems into one online environment.	$1,680,000
Penten Pty Ltd	Develop TrapDocs - an innovation that uses deception to counteract an adversary's ability to exploit information.	$492,000
Penten Pty Ltd	A sovereign tactical voice and data capability for digital interoperability in the land domain.	$1,835,000
	NSW Total	**$49,018,000**
Saber Astronautics Australia Pty Ltd	Explore development of an innovation that will use machine learning technology for autonomous identification, and model electronic threats.	$2,136,000
Sonartech Atlas Pty Ltd	Develop a mobile software platform to detect and analyse signals within maritime environment.	$941,000
AVT Australia	Develop a system capable of improving the quality of images captured by drones.	$5,243,000

Company	Contract overview	Contract value
AMSL Aero Pty Ltd	Continue development of its high speed casualty evacuation and logistic support aircraft.	$3,246,000
SME Gateway Pty Ltd	Alternative Position, Navigation and Timing (PNT) systems.	$136,000
Mission Systems Pty Ltd	Programmable Micro Influence Generator for Autonomous Mine Countermeasures.	$839,000
AVT Australia	Reduce technology size to enable integration of multiple sensors and incorporation of a range of autonomous tracking algorithms.	$1,930,000
Jenkins Engineering Defence Systems Pty Ltd	Continue development of a cost-effective maritime radar electronic support system capable of providing automated warnings and recording capability of potential threat signals without the need for a dedicated expert operator.	$3,258,000
University of Technology Sydney	Develop physiological sensors that can be used to facilitate brain–robot interaction.	$1,220,000
The University of Sydney	Continue development of a new imaging system that uses light technology to enhance real-time situational awareness.	$6,551,000
High Earth Orbit Robotics Pty Ltd	Conduct research into swarm technology that can be used to improve Defence forces' situational awareness of the space domain.	$274,000
Ocius	Continue development of its innovative Bluebottle uninhabited surface vessel.	$5,538,000
Advanced Navigation Pty Ltd	Inertial navigation system for the dismounted foot soldier.	$523,000
Armor Composite Engineering Pty Ltd	Continue development of its innovative curved body armour, which can be worn by both male and female soldiers.	$3,205,000
Thales Australia Limited	Develop its Blue Sentry autonomous sonar system, which will seek to expand Australia's surveillance capabilities in the maritime domain.	$3,815,000
Mission Systems Pty Ltd	Develop its mine neutralisation technology, which seeks to enhance the safety of ADF personnel in the maritime domain.	$2,191,000

Company	Contract overview	Contract value
BlueZone Group	Demonstrate that autonomous uninhabited surface vehicles can integrate with Anti-Submarine Warfare units to enhance underwater capability.	$7,068,000
Spiral Blue Pty Ltd	Develop a cutting-edge satellite imagery processing system capable of monitoring large geographic areas.	$644,000
	Victoria total	**$31,507,000**
Anywise Consulting Pty Ltd	Explore the development of a fleet-agnostic bridge health and usage monitoring system.	$336,000
SYPAQ Systems Pty Ltd	Prototype a small uninhabited aircraft system with a hybrid powertrain.	$3,541,000
Textron Systems Australia Pty Ltd	Develop its small uninhabited aerial system and examine its potential integration into Defence applications and systems.	$3,441,000
Fortitude East Pty Ltd	Develop a helmet system capable of reducing traumatic brain injuries caused by concussion, blunt trauma, ballistic and blast events.	$338,000
Intercorp Pty Ltd	Develop a handheld communications device that can securely share data between a soldier and broader Defence networks.	$2,038,000
BMT Design & Technology	Automated/remote systems to monitor internal condition of ship fuel tanks.	$88,000
Glia Diagnostics Pty Ltd	Develop a medical test and sample collection device that can be used to diagnose traumatic brain injury and concussion.	$1,148,000
SYPAQ Systems Pty Ltd	Develop a small, lightweight, next-generation power generator that can be tailored to land environments for both individual soldiers and vehicle-based forces.	$2,203,000
Imagine Intelligent Materials Ltd	Develop stress-sensing graphene coating on ceramic ballistic plates.	$271,000
SYPAQ Systems Pty Ltd	Develop the Corvo X, a small, lightweight surveillance capability that can be carried and deployed easily.	$2,724,000
DefendTex Pty Ltd	Develop dynamic battlefield LTE.	$981,000
DefendTex Pty Ltd	Develop anti-radiation A2/AD EMP.	$935,000

Company	Contract overview	Contract value
Agent Oriented Software Pty Ltd	Enabling resilient mobile field communications using AI and autonomous uninhabited ground vehicles.	$1,035,000
RUAG Australia Pty Ltd	Develop a new technique for repairing hulls, armour and mechanical systems.	$273,000
Deakin University – Institute for Intelligent systems Research and Innovation	Develop an Australia-based pilot training system for the Royal Australian Air Force.	$263,000
Defendtex Research Labs Pty Ltd	Explore robotic and autonomous systems for close combatants.	$5,499,000
Defendtex Research Labs Pty Ltd	Develop an enhanced drone platform that can be used across a range of operating environments.	$2,164,000
DMTC Ltd	Deliver collaborative research, development and innovation services.	$3,984,000
	SA total	**$9,966,000**
CyberOps Pty Ltd	Develop a security framework and architecture for nano-satellite development programs and operating systems.	$299,000
Silentium Defence Pty Ltd	Continue development of radar technology.	$2,076,000
DEWC Systems Pty Ltd	Develop spacecraft that can facilitate improved situational awareness in the space domain.	$3,105,000
Prism Systems Pty Ltd	Develop and demonstrate an integrated capability solution for the Royal Australian Navy.	$925,000
Silentium Defence Pty Ltd	Continue to develop space surveillance passive radar technology.	$3,488,000
DEWC Systems Pty Ltd	Target Radar Augmented Projectile replacement.	$73,000
	WA total	**$1,870,000**
AVI Pty Ltd	Develop an innovative solution to combine data from multiple systems across a range of networks.	$1,870,000

Mr. Kiriya Keat (left), representing Penten, talks with Defence Innovation Hub staff about new innovations and technologies at Army Innovation Day 2019, Australian Defence Force Academy, Canberra, ACT.

CENTRE FOR DEFENCE INDUSTRY CAPABILITY

The Centre for Defence Industry Capability is a key program in the Government's agenda to build a world-class, globally competitive Australian industry as a fundamental input to Defence capability

Program performance of the Centre for Defence Industry Capability (CDIC).

CENTRE FOR DEFENCE INDUSTRY CAPABILITY

PROGRAM IMPACT STATEMENT

The Centre for Defence Industry Capability (CDIC) plays a key role in building a world-class, globally competitive Australian defence industry. Since launching in 2016, the CDIC has partnered with Defence and industry to maximise Australian industry outcomes from the Government's high-level investment in Defence capability and build Australian supply chains to support Defence's major capital equipment programs.

Over 1,900 business facilitation and advisory services and more than $50 million in grants have been provided to Australian small and medium businesses through the CDIC, enabling them to build their capability and competitiveness and growing the capacity of Australian defence industry to meet Defence's capability needs. In 2019–20, the CDIC continued to provide specialist defence industry advisory and facilitation services to small and medium businesses working in the defence industry and increased its engagement with businesses new to the defence market.

The CDIC facilitated Australian industry connections with Defence supply chains through the Global Supply Chain (GSC) Program. Since the launch of the CDIC, GSC contracts valued at over $500 million in total have been won by 116 Australian businesses.

The CDIC continues to support the Defence innovation system by functioning as a conduit for industry to access Defence's two flagship innovation programs: the Defence Innovation Hub and the NGTF. By connecting Australian innovators to these innovation programs, the CDIC is helping to turn Australian innovations into game-changing capabilities for the ADF.

In April 2020, the Minister for Defence Industry, the Hon Melissa Price MP, commissioned CDIC Advisory Board co-chairs Ms Kate Carnell AO and Mr Tony Fraser AO, CSC to undertake an independent review of the CDIC to ensure it is optimised to get more Australian businesses engaged in the defence sector into the future. Its findings will be published in the second half of 2020, and the recommendations of the review will be implemented during 2021.

CDIC performance is reported over the following pages. Strategic measures are reported qualitatively, supported by quantitative performance information.

Grow the capability and capacity of Australian industry

ADVISORY AND FACILITATION SERVICES

The Government is committed to maximising Australian business involvement in the defence industry – particularly for innovative micro, small and medium businesses. The CDIC works closely with businesses to increase their ability to compete for opportunities, deliver products and services on time, improve business productivity and sustainability, and to support globally competitive innovation within the defence market.

In 2019–20, the CDIC commenced 267 new formal one-on-one advisory and facilitation services, including 57 to small business in regional and rural areas, and finalised 165 services. These services connect businesses to Defence and provide information and advice on matters such as Defence procurement processes, security (including cyber security), commercialisation, reducing barriers to exports, business planning, financial strategies, and standards and accreditations.

The CDIC's Defence Business Advisory Services team consolidated a number of specialist roles during the period and increased the number of Defence Business Advisers to accommodate the continued rise in demand from business for advisory services. In June 2020, the team was providing approximately twice the volume of advisory services compared to the previous year.

The CDIC's Defence Industry Facilitation Services team delivered almost 700 defence information engagements for businesses in 2019–20. These engagements are designed to help businesses understand the defence market, how to engage in Defence procurement and how to make the right connections. The team also assisted Defence units and defence industry associations with a range of services such as stakeholder engagement.

Fifty five per cent of clients indicated that they were 'very satisfied' with the services and advice provided to them by CDIC Defence Business Advisers and Defence Industry Facilitators, 36 per cent indicating they were 'satisfied', and five per cent answering 'neutral'.

For more information on defence industry advisory and facilitation services, visit business.gov.au/cdic.

CASE STUDY

Sayfa install tailored fall arrest systems on Anzac Class Frigates

Victorian safety business Sayfa designed and installed a customised fall arrest system for ANZAC Class frigate HMAS Toowoomba.

Corporate Business Manager Jeremy Parker said BAE approached the Australian-owned company as the Royal Australian Navy was looking for ways to improve the safety of helicopter maintenance in the frigate hangars.

'It's often slippery and wet in the hangars, especially when you're out at sea, so we designed a custom fall arrest system to protect operators working at height,' Mr Parker said.

'The Raptor is an Australian-made rigid rail safety system. The operators connect their harness to the rails installed in the deck head, allowing them to move freely while connected. If there is a fall the system immediately arrests it and stops the operator from falling to the ground and severely injuring themselves.

'The Raptor fall arrest system is the first of its kind and is transforming the way the Navy think about working at heights.'

The Raptor is being rolled out across all ANZAC Class frigates.

'Our work on the Raptor fall arrest system, has led to other business with the Navy. They are interested in using our harnesses on all of their vessels. There is also potential to export the Raptor,' Mr Parker said.

'Our ongoing engagement with the CDIC provides us with a broader understanding of how Defence operates, who the key 'primes' are and events we should be going to. It makes us feel more knowledgeable about working in Defence.'

Sayfa is currently working on other safety systems it believes Defence will be interested in.

'We're starting conversations with the CDIC for our next project.'

OUTREACH EDUCATION ACTIVITIES

To extend the reach of the CDIC to as many businesses as possible, the CDIC coordinates and delivers outreach events that are targeted, informative and accessible for small and medium businesses. These events have the capacity to reach a large volume of businesses, including those in regional areas, helping the CDIC expand its networks and build awareness of defence industry opportunities.

In 2019–20, the CDIC delivered outreach education activities covering a range of topics.

- A series of Defence Business Workshops commenced in February 2019 across regional Western Australia and will continue throughout 2020–21. The workshops provide an overview of CDIC services and grants, information on networking events for the defence industry, and updates from regional Defence representatives and key Defence programs, including those specific to the region.
- US Export Controls Training Seminars were delivered in early 2020. These seminars aimed to provide practical expertise and current best practice for handling technologies controlled under International Traffic in Arms Regulations (ITAR) or Export Administration Regulations (EAR).
- The Defence Industry Insights webinar series was launched in June 2020. The monthly webinar series provides current and practical information on a range of topics to assist small and medium businesses working in the defence industry

In addition to CDIC coordinated events, the CDIC participated in AusIndustry business acceleration information sessions and a range of other third-party stakeholder engagement events in both capital cities and regional centres throughout the year.

- These events provided an opportunity to give businesses an overview of the CDIC, its advisory services and associated grant programs, and general advice on doing business in the defence sector. They allowed CDIC Defence Industry Facilitators and Defence Business Advisers to make initial contact with regional businesses who may be interested in CDIC services and grants, and provide access to businesses that may not have previously considered entering the defence market.

CASE STUDY

Urban Active

Urban Active used a CDIC webinar as a way to find new clients.

The architecture business specialises in converting complicated construction programs into 3D animations and presentations so clients can visualise a project.

Director Roland Machaalani said the business had worked for Defence indirectly with builders and other architects before but was interested in connecting directly.

'I booked in for the webinar as I wanted to learn how we can offer our services directly to Defence on projects my current clients wouldn't get exposure to,' Mr Machaalani said.

'Before I found the webinar, I wasn't aware the CDIC existed. It's a great resource as the CDIC explain Defence in bite-sized pieces and make it accessible for the industry.

'After the webinar I reached out to the CDIC to learn more.

'A Defence Industry Facilitator got in contact with us and organised a face-to-face meeting. They explained all the different avenues available to us to reach out to different areas in Defence.

'They followed up with more information for us to explore.

'It did help point us in the right direction of work or what our next steps are and focus our approach on which departments we want to reach out to.

'We know we can help Defence to prepare a more accurate brief to go to the market to look for builders, architects, consultants because they'd be able to hand over a much better set of drawings that can explain the methodology or their vision a lot clearer with the use of either animation or proper 3D models of the existing assets.

'The webinar provided the big picture, now I will spend time going though information supplied by the emails I've got from Petr and then it's going through and getting back to him with any specific questions and you have to find the right contacts in defence.

'COVID restrictions made everything challenging for us to meet new clients and we're actually looking at trying to find a new source of work.'

PERSONAL PROFILE

Stephen Harvey
Defence Business Adviser

Stephen Harvey attributes his understanding of what businesses are up against when working with Defence to his 10-plus years working in the private sector defence industry.

Before joining the CDIC in early 2019, Stephen was CEO of Electromold, a surface finishing business that transitioned to the defence and aerospace industry, working on programs such as the F35 Joint Strike Fighter Program.

Stephen then moved to RUAG Australia, a company supplying into dedicated Defence programs. Stephen also spent five years as the President of the Australian Industry Defence Network (AIDN) in Victoria.

His experience has taught him to be patient when transitioning to Defence and he often advises businesses approaching the defence industry to remember that it is not a sprint, it's a marathon.

'With $270 billion of strategic Defence spending on the table, businesses assume the contracts are ready and waiting, but it doesn't work that way. You have to ensure your business is defence ready,' Mr Harvey said.

'However, often the reward for patience and persistence is the opportunity for long-term contracts.

'Initially you might be awarded contracts on a short-term basis, but once you've proven yourself, you could have the opportunity to be onboard for the duration of a project.'

Like any industry, defence is relationship driven. Stephen's advice for businesses looking for defence opportunities is to get to know your targets, get them to understand your capability and keep the communication going.

'The services on offer through the CDIC will greatly assist your business when considering stepping into the defence industry or maturing your existing journey. It's important to get connected and understand what opportunities are out there. We have a wealth of information and experience to assist your business.'

CONTINUED GROWTH IN DEMAND FOR GRANTS

In 2019–20, the CDIC administered grants across five programs.

- **Capability Improvement Grants.**

  The CDIC approved 119 Capability Improvement Grants (CIGs), worth a total of $3.78 million, to 59 Australian businesses, including eight grants worth $322,465 to regional and rural business. Over 65 per cent of the grants (based on value of funding) related to business improvements for internal systems and strategic planning. By way of comparison, in 2018–19, $2.34 million worth of CIGs were approved for 46 businesses. Through the CIGs, the CDIC helps Australian businesses deliver cutting-edge technologies, become more competitive and gain access to international export markets.

- **Sovereign Industrial Capability Priority Grants.**

  The CDIC approved 28 Sovereign Industrial Capability Priority (SICP) Grants worth a total of $11.56 million to 28 Australian businesses in 2019–20, including two grants worth $305,429 to regional and rural business. By comparison, in 2018–19, 28 SICP grants, worth $15.03 million, were approved to 28 Australian businesses.

- **Defence Global Competitiveness Grants.**

  The CDIC approved 21 Defence Global Competitiveness (DGC) Grants worth $2.27 million to 18 Australian businesses, including five grants worth $690,020 to regional and rural business. By comparison, in 2018–19, nine DGC grants worth $1.28 million were approved for nine Australian businesses.

- **New Air Combat Capability – Industry Support Program.**

  The New Air Combat Capability – Industry Support Program (NACC-ISP) provides grants of up to $1 million to help businesses win work associated with the Joint Strike Fighter program. This program is coming to a close, with $809,519 funds remaining at the end of June 2020. In 2019–20, the Department of Defence approved 5 NACC grants worth $2.56 million to 5 Australian businesses, compared to $4.23 million in NACC grants awarded to 5 Australian businesses in 2018–19.

- **Australia–United States Multidisciplinary University Research Initiative (AUSMURI).**

  AUSMURI encourages Australian universities to collaborate with US universities and complements the Multidisciplinary University Research Initiative grant program administered by the US Department of Defense. One AUSMURI grant was approved in 2019–20 with a value of $3 million. There were no AUSMURI grants approved in 2018–19.

In 2019–20 the CDIC also worked with Defence on the development of two new grants for launch during 2020–21.

- **Skilling Australia's Defence Industry Grant.**

  The Skilling Australia's Defence Industry (SADI) Grant will provide support for training and skills development linked to Defence capability, helping to reduce barriers faced by small and medium defence businesses in upskilling or retraining their staff.

- **Joint Strike Fighter Industry Support Program – Sustainment Grant.**

  The Joint Strike Fighter Industry Support Program – Sustainment Grant will support the sustainment phase of the Joint Strike Fighter program, helping businesses win work to provide maintenance and repair activities for Joint Strike Fighter components.

CASE STUDY

Defence work towards DISP membership with grant funding

Silentium Defence accessed two Capability Improvement Grants to set the business up for Defence Industry Security Program (DISP) membership.

Business Operations Manager James Forrest said the company wanted to mature its IT and cyber security, in line with the Australian Cyber Security Centre (ACSC) best practice recommendations.

'It's essential to have excellent IT and cyber security given the nature of the technology that we're developing.'

Silentium Defence develops passive radar technology for three main markets – defence, space and critical infrastructure – providing situational awareness for operators to know what's around them.

'Going forward, having DISP membership is a necessity. Defence is such an important customer for us and having a DISP membership is usually required or highly recommended when contracting with Defence.'

Businesses can self-nominate for one of four levels of DISP membership – Entry, Level 1, Level 2 and Level 3.

'Civilian customers expect to see a similar level of maturity as well. It's certainly a selling point to work in the civilian market but have that Defence standard.'

Silentium Defence started working with the CDIC in 2018 to gain a deeper understanding of the defence industry and help improve business maturity and growth.

'There's a lot of help out there and you should leverage as much as you can. One of the great things about engaging with the CDIC has been the opportunity to spend time with the Defence Business Advisors. They've got a wealth of expertise and experience in defence industry, and being so well connected have opened up doors for us.'

ENHANCING GLOBAL COMPETITIVENESS AND INCREASING AUSTRALIAN EXPORTS

The defence industry is truly a global market, in terms of both supply and demand. The CDIC helps Australia's defence industry to:

- improve its competitiveness
- achieve economies of scale across global supply chains
- grow and sustain business across acquisition life-cycles by accessing international markets.

Through its defence industry advisory and facilitation services, the CDIC – working with the Australian Defence Export Office – supports a broad range of small and medium businesses to become globally competitive, overcome barriers to exporting and win export contracts.

The CDIC also supports Australian defence exports with Defence Global Competitiveness Grants. These grants have helped Australian businesses improve their international competitiveness and increase their technical capacity through the purchase of plant and equipment and support for improved business systems. The grants have assisted Australian small and medium businesses to access opportunities in a number of significant defence export markets including the United States, Canada, the United Kingdom, Germany, France, Sweden, Norway, Singapore, Malaysia, South America and the Middle East. They have also provided opportunities for Australian companies to replace imports into the Australian market.

The CDIC manages the Global Supply Chain (GSC) Program on behalf of Defence, working with defence primes to identify opportunities for Australian businesses within their international supply chains.

As of 30 June 2020, the eight primes contracted under the GSC Program were:

- BAE Systems
- Boeing
- Leidos
- Lockheed Martin
- Northrop Grumman
- Raytheon
- Rheinmetall
- Thales.

In 2019–2020, the defence primes collectively awarded contracts to 63 Australian small and medium businesses totalling over $150 million. Since the launch of the CDIC on 6 December 2016, the GSC has helped 116 local companies and organisations win 663 defence industry contracts worth over $500 million. The total value of contracts awarded under the GSC Program since 2007 is more than $1.2 billion.

Australian small and medium businesses are benefiting from exporting products manufactured in Australia. This includes products developed for programs such as BAE's Type 26 frigate program and Thales Australia's land vehicles, explosive ordnance and underwater sonar systems. The manufacture and export of these products

enables long-term growth and development of the Australian defence industry.

The GSC Program works with the Australian Defence Export Office (ADEO) to support Team Defence Australia (TDA) events and to facilitate exports. Bringing export-ready businesses to the ADEO to participate in TDA events is an important part of the CDIC's facilitation and communications role. The CDIC continues to help small and medium businesses prepare for export. It helps them to get the most out of trade missions, leveraging relationships with Defence primes participating in the GSC Program and running workshops to help them to maximise the benefits of trade show participation.

RESPONSE TO COVID-19

During the first half of 2020, the CDIC responded to the impacts of COVID-19 to ensure continued provision of grants, services and outreach activities to help clients minimise the impact of COVID-19 on their businesses.

Demand for the CDIC's advisory and facilitation services remained strong, and the CDIC's Defence Industry Facilitators and Defence Business Advisers responded to travel restrictions and social distancing protocols by conducting the majority of client engagements by phone or videoconference.

During the initial onset of COVID-19 in Australia, the CDIC developed and launched a focused Business Continuity Management service and guidance document. These products were developed, tested and launched in less than one week and were available to defence industry businesses one to two weeks ahead of similar BCM service offerings. The CDIC delivered over 60 Business Continuity Management services and received positive feedback about the usefulness of the service.

The CDIC fielded a number of specific enquiries from defence industry businesses seeking to provide medical supplies in response to COVID-19 requirements, and these enquiries were forwarded through to the appropriate response registers.

The CDIC reshaped its outreach program, focusing on an interactive online delivery model. These online events have provided opportunities for small and medium businesses in both major cities and regional areas to hear from, and interact with, CDIC personnel and other industry experts.

Face-to-face delivery of the CDIC's US Exports Control training was interrupted by COVID-19. The CDIC produced a video training package, which was augmented by live streamed Q&A sessions during which registered participants could talk directly with, and ask questions of, the experts.

To assist small business with cash flow and business continuity, CDIC grants were assessed more frequently and projects were extended up to 12 months where a client could demonstrate the impact of COVID-19 left them unable to complete their project within the eligible project timeframe under the Program Guidelines.

Supporting Defence programs and priorities

The CDIC works with Defence and DISER to keep industry informed about Defence priorities and defence market opportunities, and to keep Defence abreast of changing industrial capabilities and innovative approaches to investment.

The CDIC continues to work closely with businesses to ensure they know about Defence's Australian Industry Capability (AIC) program and to maximise opportunities for Defence prime contractors to utilise Australian businesses in their work programs.

The CDIC continues to support the implementation of the Defence Industrial Capability Plan and associated Sovereign Industrial Capability Priorities (SICP), providing industry information on the development of SICP Implementation Plans and administering the SICP Grants.

In 2019–20, SICP Grants were awarded across all ten Sovereign Industrial Capability Priorities, with more than half of all funding supporting Collins Class submarine maintenance and upgrade projects, continuous naval shipbuilding and land combat vehicle technology.

The CDIC also continues to work closely with major Defence projects such as the Joint Strike Fighter program and the Hunter Class Future Frigate program in order to assist Australian businesses to become part of these program supply chains.

HELPING AUSTRALIAN BUSINESSES BREAK INTO DEFENCE SUPPLY CHAINS

The CDIC is instrumental in advising Australian businesses how to become part of Defence supply chains and alerting them to contract opportunities. The CDIC informs industry about Defence opportunities through its network of personnel, through business.gov.au/cdic and through the Defence Industry and Innovation e-newsletter

CASE STUDY

Savanna Solutions upskills indigenous and regional workforce to support Defence

With over ten years working with Defence as a sub-subcontractor, Savanna Solutions has adapted its offering to take full advantage of Defence opportunities in the Northern Territory.

The 12-year-old Katherine-based Indigenous business specialises in Indigenous and regional workforce development, upskilling and screening candidates primarily for Defence work.

Managing Director Alice Beilby said the business's new structure will better suit the needs of defence primes and will have a tailored onboarding system to ensure the workforce can be scaled up and down as needed.

'While working with defence contractors, I identified process gaps when engaging Indigenous businesses and employing Indigenous people', Ms Beilby said.

'I think people underestimate how many skilled Indigenous people we have in the workforce.

'In the new structure I aim to have a pool of candidates trained with the necessary skills to begin defence industry project work.

'My role will be to provide candidate documentation such as resumes, assessments of skills and identify any training they may need. This allows me to better identify what roles they are most suited to and at what level they can take on training positions or apprenticeships.

'I am not a labour hire company but add value to the supply chain by matching the vacancies of subcontractors with the local and Indigenous workforce talent pool.'

Savanna Solutions contacted the CDIC for advice on how to engage with Defence and primes directly.

'Even though I have engaged with Defence for a long time, it's such a big industry. I need to keep up to date with my knowledge and skills and work out how to best position my business.

'It's beneficial for a business advisor to sit down look at your business with a different lens.'

Providing leadership and partnership

COMMUNICATION AND PROMOTIONAL ACTIVITIES

The CDIC promotes its services through a range of communications channels and activities showcasing its service benefits to businesses, and publicising successful case studies and opportunities for industry. These channels include an e-newsletter (with more than 4,000 subscribers), the CDIC website, social media, outreach education activities and face-to-face delivery at major public trade shows.

In 2019–20, the CDIC's website (hosted on business.gov.au) migrated to a newer content management system, allowing for the redesign of CDIC web content to make it easier for users to find information. Encouragingly, in 2019–20, the CDIC received over 133,000 unique views on business.gov.au and received approximately 700 contact centre enquiries.

CASE STUDY

AeroPM supports the transition of veterans to the defence industry

AeroPM, the 2020 Outstanding Veteran Employer of the Year, is putting measures in place to support veterans' transition from service to the defence industry.

With 90 per cent of the professional services firm's employees transitioning directly from Defence, AeroPM aims to fill the defence industry with highly skilled veterans.

General Manager Adam Frizell said the company tries to attract the right people to AeroPM, and the right people for them are veterans.

'Veterans could have up to 25 years' of intensive experience solving Defence's complex problems and during their military careers they may have been responsible for the acquisition of the P-8A or sustainment of the Collins Class submarine,' Mr Frizell said.

'They have an important skill set to recognise.'

Transitioning to defence industry

AeroPM has a dedicated program to support veterans' transition from Defence.

'Many of the veterans that approach AeroPM have only ever worked for Defence. We want to provide an opportunity for veterans to transition into the defence industry in a controlled and supported manner,' he said.

'It's important to recognise it's not easy to transition into a new environment and if we don't support our veterans we could lose their experience and skills to another industry.

'If an applicant doesn't quite suit our recruitment criteria we recommend them to companies in the defence industry where they may be more suited. It's not just about recruiting for AeroPM, it's about the transition from Defence to the defence industry.

'We want to be able to support fellow companies to boost the defence industry in general.'

AeroPM and the CDIC

AeroPM's objective working with the CDIC is to mature its business systems in general.

'We understand Defence, acquisition and projects very well but by no means are we experts in business.

'A Defence Business Adviser helped us mature our business systems. We developed a strategic communications and stakeholder engagement plan which created visibility in the market for AeroPM, something we are regularly praised on.'

The company also accessed a Capability Improvement Grant for a range of systems improvements.

The Capability Improvement Grant provides matched funding up to $250,000 to engage a consultant or expert to implement business improvements based on CDIC advice.

MAJOR EVENTS

In 2019–20, the CDIC participated in the following major defence industry events:

- 2019 Pacific International Maritime Exposition (Sydney)
- Supply Nation Indigenous Business Trade Shows (multiple cities)
- National Manufacturing Week (Melbourne)
- MilCIS (Canberra).

The CDIC coordinated a trade stand at the 2019 Pacific International Maritime Exposition (Pacific) under the Defence Industry & Innovation brand, which included participation from the Defence Innovation Hub, the NGTF and the Defence Industry Security Program.

The CDIC's involvement in Pacific and similar events increased visibility of the Defence Industry and Capability Innovation programs. This provided an important platform for strengthening the relationship between Defence and industry, attracting new small and medium businesses into the defence market and informing them on how to navigate the defence market.

A broad range of activities were undertaken to communicate directly with the CDIC's target audience throughout the trade show. This included an interactive touch screen promoting both CDIC and Defence programs, video screen displays, printed marketing collateral, merchandising, and branded signage displayed at CDIC program sessions.

The CDIC also increased engagement with small and medium businesses by presenting three program sessions. The Global Supply Chain (GSC) program networking event provided an opportunity for interested businesses to learn about the GSC Program and meet with representatives from the participating prime contractors. In addition, two new programs were delivered that incorporated presentations and discussions with experienced small and medium businesses on business challenges and strategies for success. These were followed by networking opportunities that enabled participants to discuss potential partnerships.

Continuous improvement

THE CDIC IN 2020–21

The CDIC's national presence and experienced team are helping Australian industry to provide a solid foundation to meet Defence's evolving capability needs into the next decade.

The CDIC will continue to work with key stakeholders to drive the development of industry capability and capacity in support of the ADF, and continue to support defence industry to meet the challenges and embrace the opportunities linked to the Government's $200 billion investment in Defence capability.

Following the independent review into the CDIC, the CDIC will implement recommendations arising from the review in 2020–21 to ensure it can continue to support the growth of the Australian defence industry now and into the future.

The CDIC proactively seeks and responds to feedback as part of its commitment to continuous improvement. CDIC services and client achievements are promoted through case studies, presentations and displays at public events and media engagement.

The CDIC will continue to work closely with other industry programs, such as the Cooperative Research Centres program, the Venture Capital program, the Entrepreneurs' Programme, the Research and Development Tax Incentive program and Austrade to maximise Government assistance to industry.

INDUSTRY POLICY IMPACT AND ENGAGEMENT THROUGH THE INTEGRATED INVESTMENT PROGRAM

Progress continues on implementing key initiatives of the *2016 Defence Industry Policy Statement*. Defence has sought to:

- create the long-term policy settings to shape our defence industry
- incorporate industry as a fundamental input to capability across Defence business processes, and
- support industry development and innovation.

The integration of Australian industry as a fundamental input to capability ensures Defence fully considers the capacity of the Australian industrial base to deliver Defence capability.

IMPACT OF COVID-19 ON AUSTRALIAN DEFENCE INDUSTRY

Defence industry, especially the small and medium businesses that are a critical part of the sector, has collectively worked extremely hard to keep its businesses operating throughout the COVID-19 pandemic.

Defence has worked to keep Defence industry working through a number of initiatives:

- Defence established a COVID 19 Industry Support Cell to respond quickly to urgent issues affecting our defence industry. As the pandemic evolved, we worked closely with a range of stakeholders, including defence companies and international airlines, to facilitate continued trade of defence goods and services and remain connected to the Whole-of-Government COVID response.
- Defence facilitated regular Ministerial teleconference meetings with government officials, industry CEOs and industry association representatives to ensure issues were quickly identified and resolved.

Defence industry company Axiom worked with Defence to produce personal protective equipment as part of Operation COVID-19 Assist

- Defence fast-tracked the processing and payment of approximately $9.1 billion[5] in invoices to ensure cash was flowing through our supply chains.
- Defence implemented a COVID Recovery Deed with key suppliers that faced delays caused by the pandemic. The Recovery Deed and the accompanying Recovery Plan helped to chart a way for industry to continue to deliver and to ensure that the recovery of any lost time was not burdened by contractual or legal disputes and delays.
- Defence has brought forward a number of projects including around $870 million worth of estate project works, first announced in May 2020 that will be released to the market throughout 2020 to create new jobs and business opportunities across Australia.

In 2020–21, Defence will continue to look at ways to support industry during the COVID-19 pandemic and its recovery stages.

SOVEREIGN INDUSTRIAL CAPABILITY PRIORITIES

Released in April 2018, the Defence Industrial Capability Plan identified ten initial Sovereign Industrial Capability Priorities (SICPs) required to build an Australian defence industry base that can meet Defence's capability needs. Since the launch of the plan, consideration of the SICPs has been integrated into Defence planning processes. Significant progress has also been made on implementing the plan's initiatives.

- In November 2018, the Sovereign Industrial Capability Priority Grants Program was launched to support eligible small and medium-sized businesses contribute to one or more of the SICPs. The grants program receives a high rate of applications and, as of 30 June 2020, the Government has announced the delivery of 50 grants totalling over $24.8 million awarded to Australian businesses since the program was launched, helping them enhance their capacity in Defence's priority areas.
- In response to the COVID-19 pandemic, Defence has increased the rate at which grant applications are assessed. This ensures small and medium businesses that support the SICPs receive crucial funding sooner, and supports the continuity of innovation and capability growth in the defence industry.
- The Implementation and Industry plans for two of the ten SICPs were released in December 2019. The plans – for Combat clothing survivability and signature reduction technologies, and for Munitions, small arms research, design, development and manufacture – are helping businesses understand Defence's current and future requirements for these priorities.
- The remaining eight Implementation and Industry plans will be released by the end of 2020.

[5] *Defence is making payments to Australian suppliers as soon as their invoice has been approved, irrespective of the contracted payment terms. Invoices are being cleared for payment once contracted conditions, such as the receipt of goods or services, have been met.*

Thales Australia employees conduct the final visual inspection of .50 calibre ball linked ammunition at Benalla, VIC

- Extensive industry consultation is undertaken to develop each of the Implementation and Industry plans. Over 300 individual engagements have been conducted with external stakeholders, including Defence primes, small and medium businesses, academics, and industry associations.

In addition to building a deeper relationship with industry, Defence has integrated the SICPs into procurement processes. Before a Defence project goes out to tender, an internal assessment is conducted to determine whether the project includes any industrial capabilities needed in Australia. When SICPs apply, tenderers are required to demonstrate steps they will take to build, maintain or enhance those capabilities locally. A businesses' ability to deliver an Australian industrial response is factored into evaluation of bids.

AUSTRALIAN INDUSTRY CAPABILITY PROGRAM

Defence has further strengthened the Australian Industry Capability (AIC) Program to provide greater assurance and opportunities to the small business community into the future.

The AIC Program is a major lever for maximising opportunities for Australian industry participation in Defence procurements, including those that support our SICPs and the long-term development of our defence industry.

The Government is delivering a more capable ADF, supported by a $270 billion

investment in new Defence capability over the next decade. Through maximising Australian industry participation in Defence procurements, where it represents value for money, Defence is building a stronger, more robust and resilient, and internationally competitive Australian defence sector to help deliver, maintain and sustain this capability build.

The 2019 Defence Policy for Industry Participation (DPIP) built on the success of the AIC Program and extended the requirements for AIC Plans to materiel and non-materiel procurements of $4 million and above, or $7.5 million and above for construction services. The 2019 DPIP requires tenderers to demonstrate genuine consideration of Australian industry throughout the tendering process and detail how they have maximised opportunities for industry, in particular small and medium enterprises. Where capability procurements include the SICPs, tenderers are required to identify the actions they will take to develop, support or enhance Australian industry's ability to deliver an enduring sovereign industrial capability.

In 2019–20, seven AIC Public Plans were published on the Defence Industry Policy Division website. These set out the plans and forecast opportunities for Australian industry participation in major Defence capability projects and sustainment activities. These can be found at defence.gov.au/spi/industry/PublicPlans.asp.

The Minister for Defence Industry the Hon Melissa Price MP, Head Aerospace Systems Division CASG Air Vice-Marshal Greg Hoffman, and Senator the Hon Jim Molan at Defence Company Linktek. Lintek have developed an innovative manufacturing system which forms part of the F-35 global supply chain program

In accordance with the DPIP, Defence is introducing:

- a risk-based AIC assurance framework that includes the Independent AIC Plan Audit program. The framework will provide a transparent process for detection, referral for assessment, validation, and reporting on non-compliance (or risk of non-compliance) with individual contracted AIC Plans, and allows remediation actions to implemented and monitored on an ongoing basis.
- an enhanced AIC contractual framework and supporting artefacts with more specific and measurable AIC commitments that promote greater accountability for achieving the AIC objectives. AIC obligations will now be expressed as essential terms of the contract, and Defence will also have enhanced contractual remedies for failing to achieve these obligations.

These enhancements will make Defence a stronger client, maximise opportunity for Australian businesses and protect small business interests.

DEFENCE INDUSTRY SKILLING AND STEM STRATEGY

The 2019 Defence Industry Skilling and STEM Strategy supports the Government's long-term vision to build and develop a robust, resilient and internationally competitive Australian defence industrial base.

The strategy is designed around four pillars that help Australia's defence industry develop a workforce with the knowledge and skills to meet Defence's capability needs over the coming decade.

- **Engage:** improve access to information about defence industry and career opportunities to promote growth in the volume of workers joining the defence industry.
- **Attract:** support defence industry to grow and sustain a national defence industry workforce by leveraging the existing or soon-to-be workforce pool.
- **Train** and Retain: encourage investment in skills and providing support to defence industry businesses to enhance existing workforce capability.
- **Collaborate:** improve cooperation, coordination and collaboration across all stakeholders to identify trends, align objectives and optimise the use of funding.

The National Defence Industry Skills Office was established following the launch of the Defence Industry Skilling and STEM Strategy to streamline governance and policy for defence industry skills issues. The goals of the Strategy are further harnessed and reinforced in the Defence STEM Workforce Strategic Vision, released by the Defence STEM Council in August 2019.

Over the last year, Defence has continued implementing a number of initiatives introduced in the Defence Industry Skilling and STEM Strategy.

- Prior to COVID-19 restrictions, Defence participated in nine job fairs or expos across states and territories, promoting defence industry as a potential career pathway for students, school leavers and job seekers.

- The Defence Industry Internship Program was expanded in 2019–20 to provide 70 internships for engineering students to work with defence industry small businesses. This program creates engineering pathways for students to gain industry experience through a 12-week internship and allows the business to showcase their industry to prospective future members of the workforce. From the 2019–20 cohort to date, 35.5 per cent of completed internships have already been offered continued employment with their host small and medium businesses, with some students yet to complete their degrees. An additional 14 per cent of interns from the 2019–20 cohort are being considered for future positions by their host small and medium business after they complete their degree.
- The School Pathways Program continues to play an integral role in Defence's early engagement strategy to inform young Australians about the varied pathways into and career options within the defence industry sector. A total of $2.6 million was committed to the program in 2019–20.
- From 6 to 7 November 2019, more than 100 educators, industry experts and government representatives gathered in Perth for the inaugural National Defence Industry Skilling and Workforce Summit. The summit was designed to connect the various sectors required to build a skilled workforce and help build a greater understanding of future defence industry workforce needs.

CASE STUDY

The National Defence Industry Skilling and Workforce Summit

The inaugural National Defence Industry Skilling and Workforce Summit (the Summit) was held in Perth, WA, in November 2019. The Summit was attended by 103 participants including defence industry business representatives, government stakeholders (federal, state and territory), industry organisations and the education sector.

Participants at the Summit considered the defence industry's current and future skills needs and discussed opportunities to support the workforce capability and capacity of Australia's defence industry.

Through a program of discussions, participants generated as many new ideas as possible to support defence industry workforce needs without considering the usual constraints (budget, resources, feasibility and timeframes for delivery). Participants focused on new approaches, collaboration, co-investment and shared responsibility for achieving outcomes.

This exercise helped identify the key areas in which participants thought there was the most opportunity for development or advancement. Defence collated the outcomes of the Summit and circulated a discussion paper for consideration by stakeholders. A subsequent report to Government will be provided in 2020–21.

DEFENCE ALIGNMENT WITH THE NATIONAL INNOVATION AND SCIENCE AGENDA

The *2016 Defence Industry Policy Statement* and Defence's industry and innovation programs are aligned with, and support:

- the Innovation and Science Australia 2030 Strategic Plan
- the four pillars of the National Innovation and Science Agenda (NISA).

CULTURE AND CAPITAL, TO HELP BUSINESSES EMBRACE RISK AND INCENTIVISE EARLY STAGE INVESTMENT IN START-UPS

The Defence Innovation Hub encourages Australian businesses of all sizes and from all sectors to submit innovation proposals that are ready to enter the engineering and development stages of the innovation process. Since the launch of the program, 24 per cent of the Defence Innovation Hub's partners have been new to doing business with Defence, and over 80 per cent of investment has been with small and medium businesses. The cornerstone of the Defence Innovation Hub program is procuring innovative technology for Defence, where Defence provides the capital needed for Australian industry to further develop bright ideas.

The Defence Innovation Hub has continued to nurture collaboration between industry and research organisations, with universities and research institutions involved in 39 per cent of Defence Innovation Hub projects in 2019–20. The Defence Innovation Hub has continued to implement its continuous program, reducing timeframes and streamlining the process for industry to make it easier for start-ups and innovative small businesses to do business with Defence.

COLLABORATION, TO INCREASE THE LEVEL OF ENGAGEMENT BETWEEN BUSINESSES, UNIVERSITIES AND THE RESEARCH SECTOR TO COMMERCIALISE IDEAS AND SOLVE PROBLEMS

Closer collaboration between Defence, state and territory governments, industry and research organisations is needed to jointly develop game-changing innovation and to provide greater benefits to the Australian defence industry and innovation sector. Defence is working with the best of businesses, universities and the research sector to minimise risk and solve complex and challenging problems.

The NGTF works with groups across the innovation sector and has established work programs with industry partners, universities, publicly funded research agencies, Cooperative Research Centres and strategic partners, directly supporting more than 420 jobs and 80 students. The mix of participants within each priority area helps identify opportunities for collaboration across the sectors. In addition, investments made by the NGTF in CRCs and strategic partnerships further support and enable cross-sector collaboration on innovation. The investments made by the NGTF also develop skills critical to future capability, most notably through its support of students.

The More, together Defence S&T strategy will further develop such collaborative partnerships by focusing our national S&T enterprise on mission-directed research to ensure Defence is best positioned to realise capability advantage in a rapidly evolving environment.

The strategy aims to transform the way Defence partners with the national S&T enterprise to achieve impact through strategic research. It is headlined by the introduction of STaR (Science, Technology and Research) Shots. In the spirit of pioneering defence S&T achievements, STaR Shots will inspire and focus the national S&T enterprise on large-scale programs of work that lead to specific leap-ahead capabilities for the ADF.

TALENT AND SKILLS, TRAINING STUDENTS FOR THE JOBS OF THE FUTURE AND ATTRACTING THE WORLD'S MOST INNOVATIVE TALENT TO AUSTRALIA

Defence has a comprehensive program that supports student interest in science, technology, engineering and mathematics (STEM), provides training opportunities, and aims to attract and skill students to develop careers directly in Defence or in defence industry or to undertake research of relevance to Defence in universities, CSIRO and other publicly funded research agencies.

The aforementioned Defence Industry Skilling and STEM Strategy supports Australia's defence industry in developing a workforce with the knowledge and skills to meet Defence's capability needs over the coming decade.

In addition, Defence launched its Science, Technology, Engineering and Math (STEM) Workforce Strategic Vision 2019–2030 in Canberra in August 2019 as part of its celebrations marking National Science Week. It outlines Defence's vision for how it will collaborate with industry and academia to build the high-tech workforce required to meet Australia's future defence and national security needs. Within Defence there exist a number of initiatives to excite, support and train future Defence STEM specialists.

The NGTF is supporting Defence activities to build the STEM pipeline needed to attract and retain a talented workforce. This support includes investing in students through several NGTF programs. As described on page 21, a key feature of many of the priority areas is the training and development of students, with many elements of the program funding students. This includes funding PhD students directly as well as support for initiatives such as the Australian Quantum PhD program and the Cyber Summer School. The NGTF has funded the participation of over 80 students through Fund projects and scholarships, a significant contribution to the building of research capacity within the university sector.

Australian Postgraduate Research Intern (APR.Intern) is Australia's only PhD internship program spanning all sectors, disciplines and universities. Supported by the Department of Education, Skills and Employment, the program connects PhD students with industry through short-term research projects, empowering students to thrive in a practical research environment. For Defence, like other businesses, APR. Intern is a platform to access some of Australia's brightest research minds and tap into new worlds of innovation.

Through APR.Intern, up to 100 PhD students will be placed as interns with Defence over four years, with students being posted to Defence laboratories for

periods of between three and five months to work on multidisciplinary projects the frontline of national security innovation. Paths to employment will be facilitated for high-performing interns. To date, 37 interns have been supported.

STEM Professionals in Schools is a national program that facilitates partnerships between schools and industry to bring STEM into the classroom. Managed by CSIRO, the program creates partnerships between researchers and teachers to bring 'real-world STEM' into the classrooms of Australian schools. Some 35 Defence scientists are involved in the STEM Professionals in Schools Program. At a time where STEM skills are critical to building an innovative Australian workforce of the future, volunteering programs like STEM Professionals in Schools are helping to inspire students by introducing them to the opportunities that STEM careers can provide.

DSTG's STEM Cadetship Program, established in 2015, was expanded across all of Defence in 2020 by the Defence STEM Council, with the first cohort of Defence STEM Cadets commencing the One Defence STEM Cadetship Program on 30 March 2020.

The STEM Cadetship Program offers students a head start to a rewarding career in Defence by offering an entry-level employment pathway for high-performing tertiary students currently studying a relevant STEM, Photography or Imaging degree.

The program supports Defence capability objectives by developing people with critical skills in areas of STEM, attracting appropriately skilled talent in a competitive labour market and filling future APS roles crucial to delivering Defence capability.

GOVERNMENT AS AN EXEMPLAR, TO LEAD BY EXAMPLE IN THE WAY GOVERNMENT INVESTS IN AND USES TECHNOLOGY AND DATA TO DELIVER BETTER QUALITY SERVICES

Defence is leading by example and delivering innovation programs with streamlined, agile processes, and is taking calculated risks to harness bright ideas. To remove barriers to innovation and deliver a streamlined and agile single innovation pipeline, the Defence innovation system has adopted:

- agile business processes and calculated risk-taking to harness bright ideas
- new contracting frameworks
- new intellectual property policies
- new governance, assessment and funding models to allow quick decision-making.

GOVERNANCE

INDUSTRY AND INNOVATION EXPERTISE

The NGTF, the Defence Innovation Hub and the CDIC are underpinned by a unified framework to ensure investment is strategy-led. Governance and operational arrangements have been established to provide strategic oversight and coordinate the Defence innovation system, ensuring visibility of funding recommendations and linking innovation investment to capability priorities.

In running the industry and innovation programs, Defence has sought input from a range of defence industry and innovation experts. The programs are underpinned by a governance framework that incorporates private sector and Defence representation.

The Defence Innovation Steering Group includes three external representatives:

- Dr Megan Clarke, Head of the Australian Space Agency, non-executive director at Rio Tinto and former CEO of CSIRO (resigned 3 December 2019)
- Ms Sarah Earey, Managing Director of L3 Micreo
- Professor Chris Moran, Deputy Vice-Chancellor, Research, at Curtin University.

The external representatives:

- provide feedback from industry and research organisations on the performance of the Defence innovation system
- advise the Defence Innovation Steering Group on innovation practices in organisations outside Defence
- provide feedback on the implications for industry and research organisations on proposed changes to the Defence innovation system.

The NGTF also uses independent experts from industry, academia and international defence science and technology organisations to review and validate the selection processes to identify research partners. These experts engage in areas where they have an acknowledged reputation.

The CDIC Advisory Board provides advice and strategic guidance to the CDIC. The board includes representatives from Defence, the defence industry and industry groups. As of 30 June 2020, its members were:

- Mr Tony Fraser (ex-officio Defence co-chair) – Deputy Secretary, Capability Acquisition and Sustainment Group
- Ms Kate Carnell (industry co-chair) – Australian Small Business and Family Enterprise Ombudsman
- Ms Kelly Elphinstone – Managing Director, Elphinstone Pty Ltd
- Mr James Fitzgerald – Executive Chairman, Civmec
- Ms Amanda Holt – CEO and Chief Engineer Defence and Aerospace, SYPAQ Systems
- Ms Kate Louis – Executive Director, Australian Industry Group Council
- Dr Karen Stanton – Director, Corporate and Strategy, Heat Treatment Australia (HTA) Group
- Mr Neil Sunners – Managing Director, Sunbuild Pty Ltd

- Mr Chris Williams – Managing Director, H.I. Fraser Pty Ltd
- Ms Christine Zeitz – General Manager, Asia-Pacific Northrop Grumman
- The Hon David Johnston (ex-officio) – Australian Defence Export Advocate.

ANNUAL REPORTING TO GOVERNMENT

This is the fourth Defence Industry and Capability Innovation Programs Update Report, and the third by financial year. The reporting framework reflects the Department of Finance Commonwealth Performance Framework Guidance, with strategic measures reported qualitatively, supported by quantitative performance information.

In addition, the NGTF is part of the strategic research stream of the DSTG portfolio and is assured by DSTG through the First Principles Review approved DSTG Investment Process. The process was also designed in response to ANAO audit recommendations.

HOW TO ENGAGE WITH DEFENCE INDUSTRY POLICY INITIATIVES

THE CENTRE FOR DEFENCE INDUSTRY CAPABILITY

The CDIC is helping to build the capability and capacity of Australian small businesses to meet Defence's requirements by helping businesses navigate, prepare for and enter the defence market. We can also help with grants for businesses to implement improvements, access export opportunities and invest in Defence's priority capabilities.

- For more information, visit: https://www.business.gov.au/cdic
- To apply for advisory and facilitation services, visit: https://www.business.gov.au/cdic/advisory-and-facilitation-services
- To apply for a grant, visit https://www.business.gov.au/cdic/grants-for-defence-industry
- To subscribe to the Defence Industry and Innovation Newsletter, visit: https://www.business.gov.au/cdic/publications-and-media
- To speak to the CDIC team, call 13 28 46 or email cdic@business.gov.au

DEFENCE POLICY FOR INDUSTRY PARTICIPATION AND THE AUSTRALIAN INDUSTRY CAPABILITY PROGRAM

The Defence Policy for Industry Participation, launched in March 2019, extends the AIC Program to include Australian and local industry requirements to most Defence procurements of $4 million and above and to procurements of $7.5 million and above for construction services.

It aims to strengthen Australia's industrial base by maximising Australian industry involvement. The policy will provide opportunities for greater Australian industry involvement in a wider range of Defence projects in more locations.

For more information, visit: http://www.defence.gov.au/SPI/Industry/AIC.asp and https://www.defence.gov.au/SPI/Industry/Industry-Participation.asp

DEFENCE INNOVATION HUB

The Government is investing $800 million over the next decade to 2030 on innovative technologies that can be developed into advanced capabilities through the Defence Innovation Hub. Companies can submit proposals to the Defence Innovation Hub at any time.

For more information, visit: https://www.innovationhub.defence.gov.au/

NEXT GENERATION TECHNOLOGIES FUND

The Government is investing $1.2 billion through the NGTF to deliver high-impact future capabilities for Defence over the next decade. The NGTF supports research projects through a range of collaboration vehicles, including Grand Challenges, research programs and Defence Cooperative Research Centres.

For more information, visit: https://www.dst.defence.gov.au/NextGenTechFund

AUSTRALIAN DEFENCE EXPORT OFFICE

The Australian Defence Export Office coordinates whole-of-government export support for Australian defence industry. This support includes:

- attendance at international trade shows with Team Defence Australia
- targeted international trade missions
- inclusion in the Australian Military Sales Catalogue
- government-to-government transfers of defence-related materiel
- high-level advocacy through the Australian Defence Export Advocate
- the US$3 billion Defence Export Facility.

For more information, visit: http://www.defence.gov.au/Export/Office/

SKILLING AND WORKFORCE

The Government launched the Defence Industry Skilling and STEM Strategy on 28 February 2019. The Strategy outlines the vision and investment to assist the Australian defence industry in meeting its workforce skills requirements over the next decade.

For more information, visit: http://www.defence.gov.au/SPI/Industry/IndustrySkillingSupport.asp

DEFENCE EXPORT CONTROLS

Defence is responsible for regulating the export of defence and strategic goods and technologies, including granting export permits. Australia's export control policies are in place to enable the export of defence and strategic goods where this is consistent with Australia's national interests and international obligations.

For more information, visit: http://www.defence.gov.au/ExportControls/

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